In Touch With Your Computer: Graphics Tablets And Light Pens

COMPUTE!'s GAZETTE

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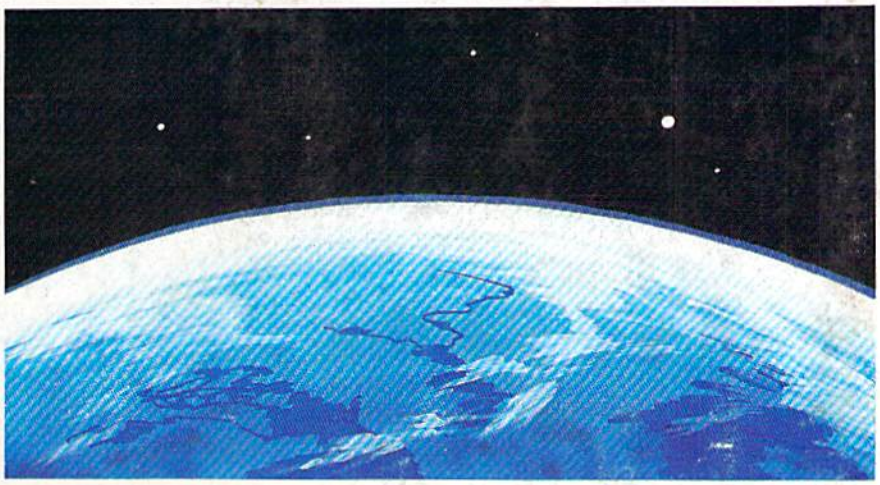
July 1984
Issue 13 Vol. 2, No. 7
02220 £1.95 UK $3.25 Canada

For Owners And Users Of **Commodore VIC-20**™ And **64**™ Personal Computers

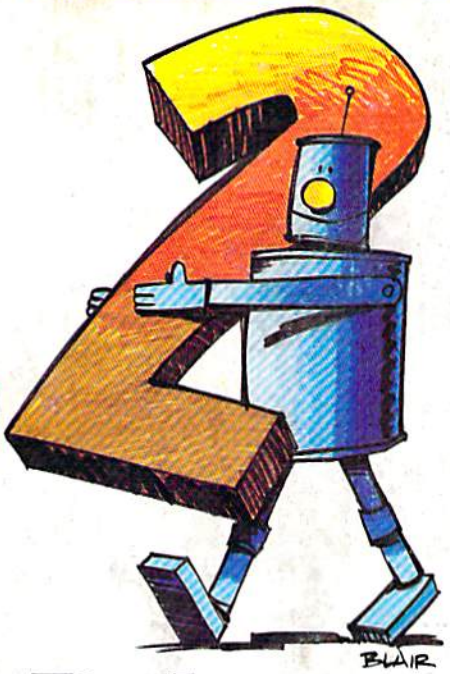


Space Patrol

Good skill and judgment are your best defenses in this fast-action game for the VIC and 64.

Horizons 64

A close-up look at Commodore's SX-64 and a new kind of voice synthesizer.



Robot Math

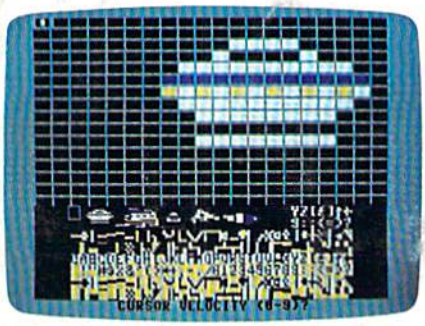
An effective and fun educational program for children. For the VIC and 64.

Also In This Issue:

Home Telecommunications: Downloading

The Beginner's Corner

Plus Reviews, Games, Tutorials, And New Products



Ultrafont +

Create custom characters with this feature-packed machine language character editor for the 64.

0 71486 02220 07

Dear Susan,

I've discovered something very exciting that I want to share with you. I've always thought assembly language was too complicated for me to learn and I've been doing all my programming in Basic, or buying software that doesn't do quite what I want. You know, Basic is just too slow for a lot of tasks, and I can't find ready made software to do those specialized things I want to do.

Well, I just bought Panther's C64 Assembler and I found out that assembly language is easier than I thought, and it's also fun.

The C64 Assembler is very "friendly" and the documentation is clear and well written. One very nice feature of the manual is a section for the neophyte assembly language programmer that really helped me understand how to use the machine.

Now I'll be able to write those programs myself instead of waiting for some software manufacturer to guess what I'm looking for! My programs will do exactly what I want, and I'll have fun writing them.

The dealer even told me that Panther is looking for good programs in assembly language, and they're willing to publish and pay royalties for useful programs which meet their standards.

As you know, I don't have any experience yet, so I can't compare assemblers, but Jim's seen it and he's a professional assembly language programmer. He says it's the easiest-to-use and the fastest assembler he's seen for any microcomputer. In fact, he said he's going to buy a Commodore 64 just so he can use it.

Come on over to my place when you have time and I'll show off the assembler for you, or go to the dealer down the street to see it. The whole Commodore community is excited about the C64 Assembler.

I've got to sign off now. I'm anxious to get back to my assembler and finish the program I'm working on. This is fun!

Let's get together soon.

Bob

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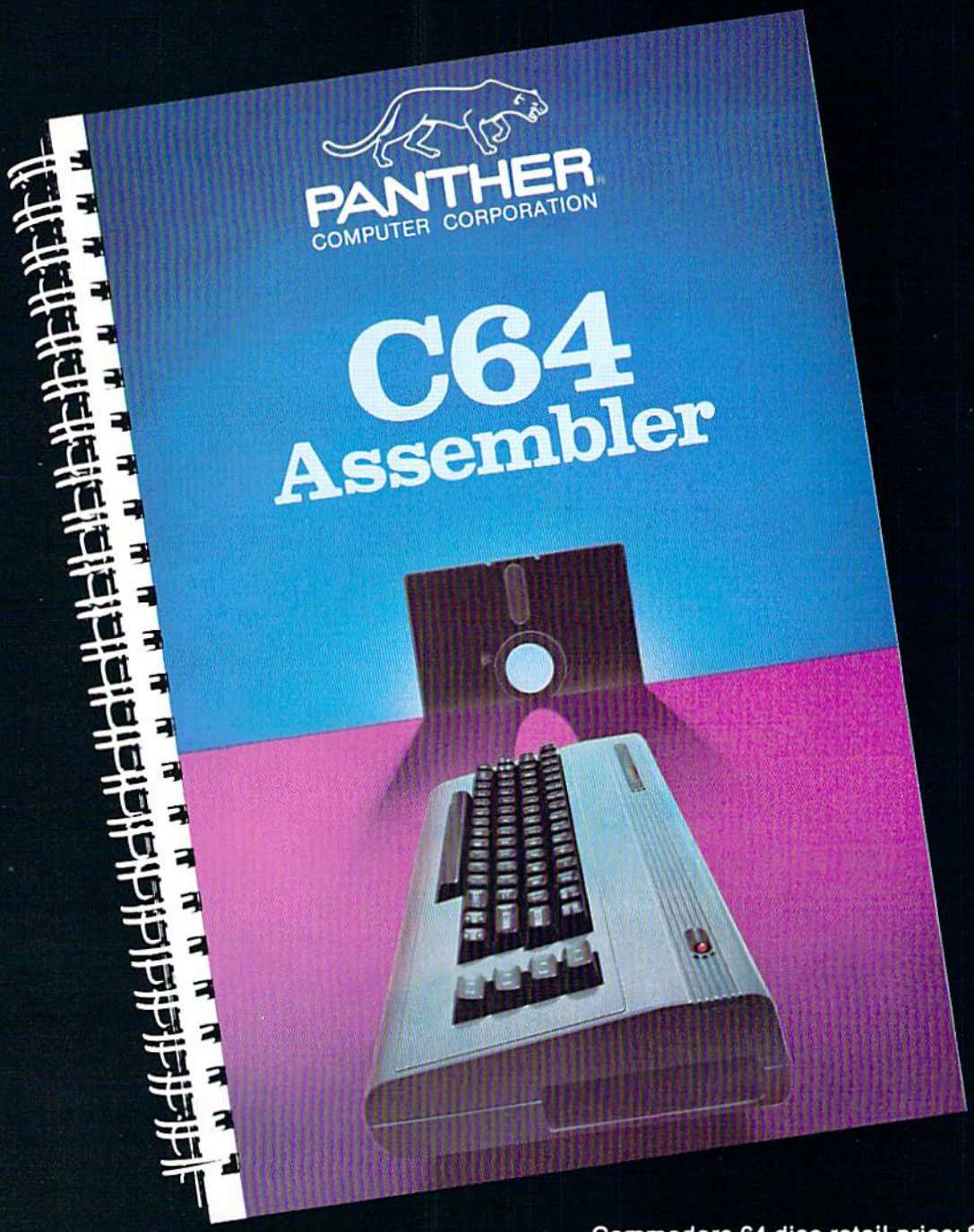
The Assembler for the Commodore 64.



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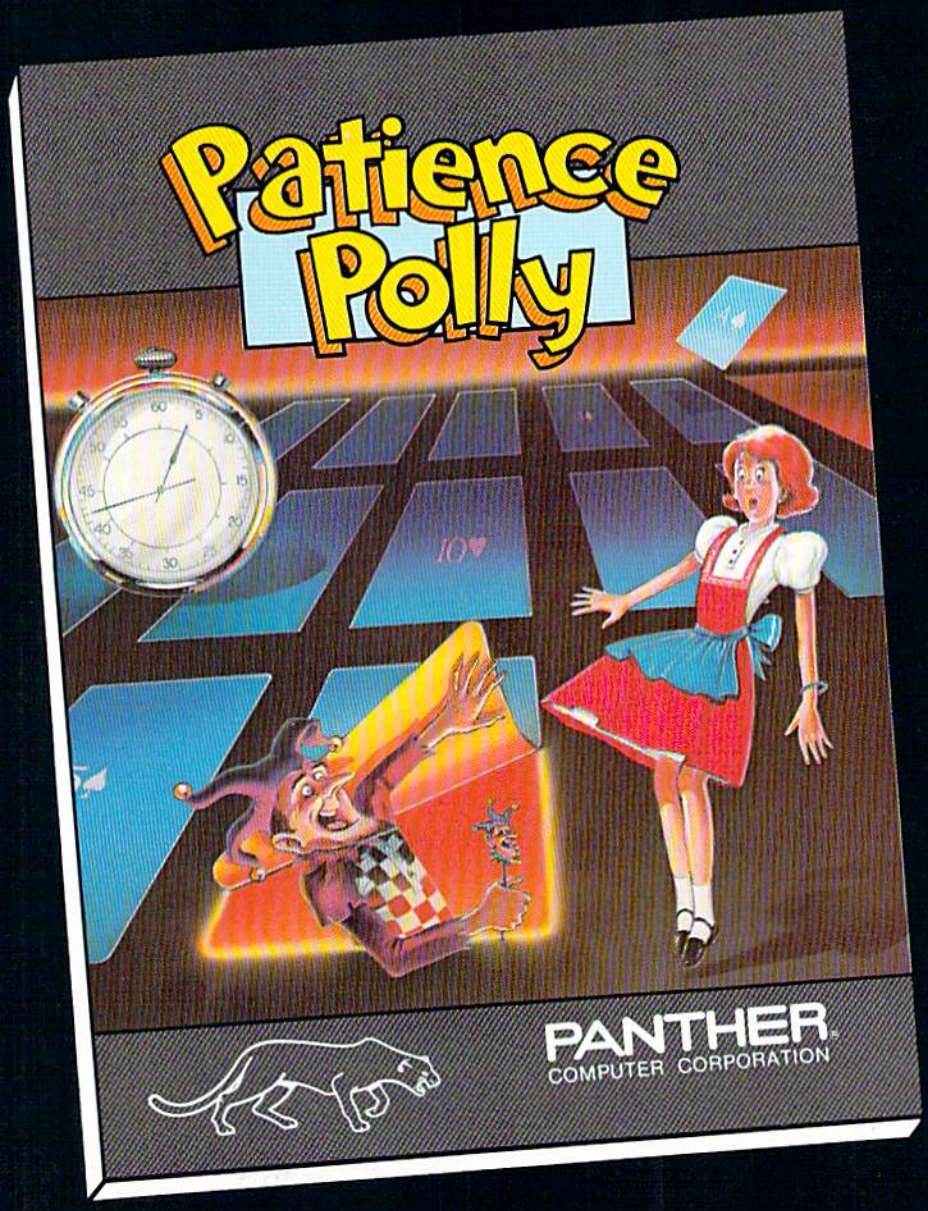

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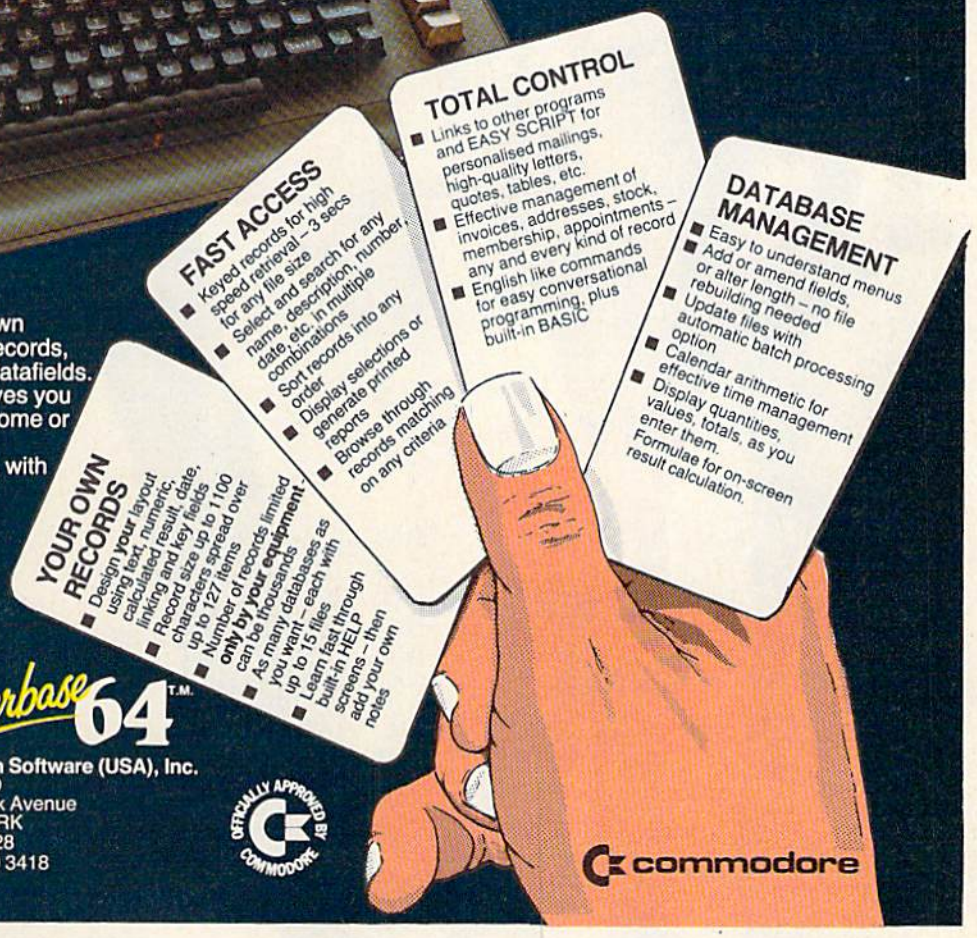
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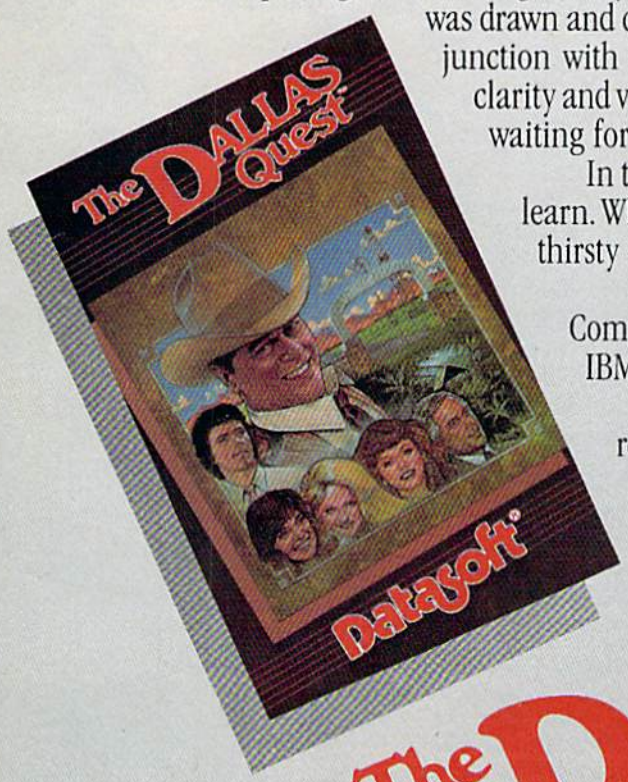

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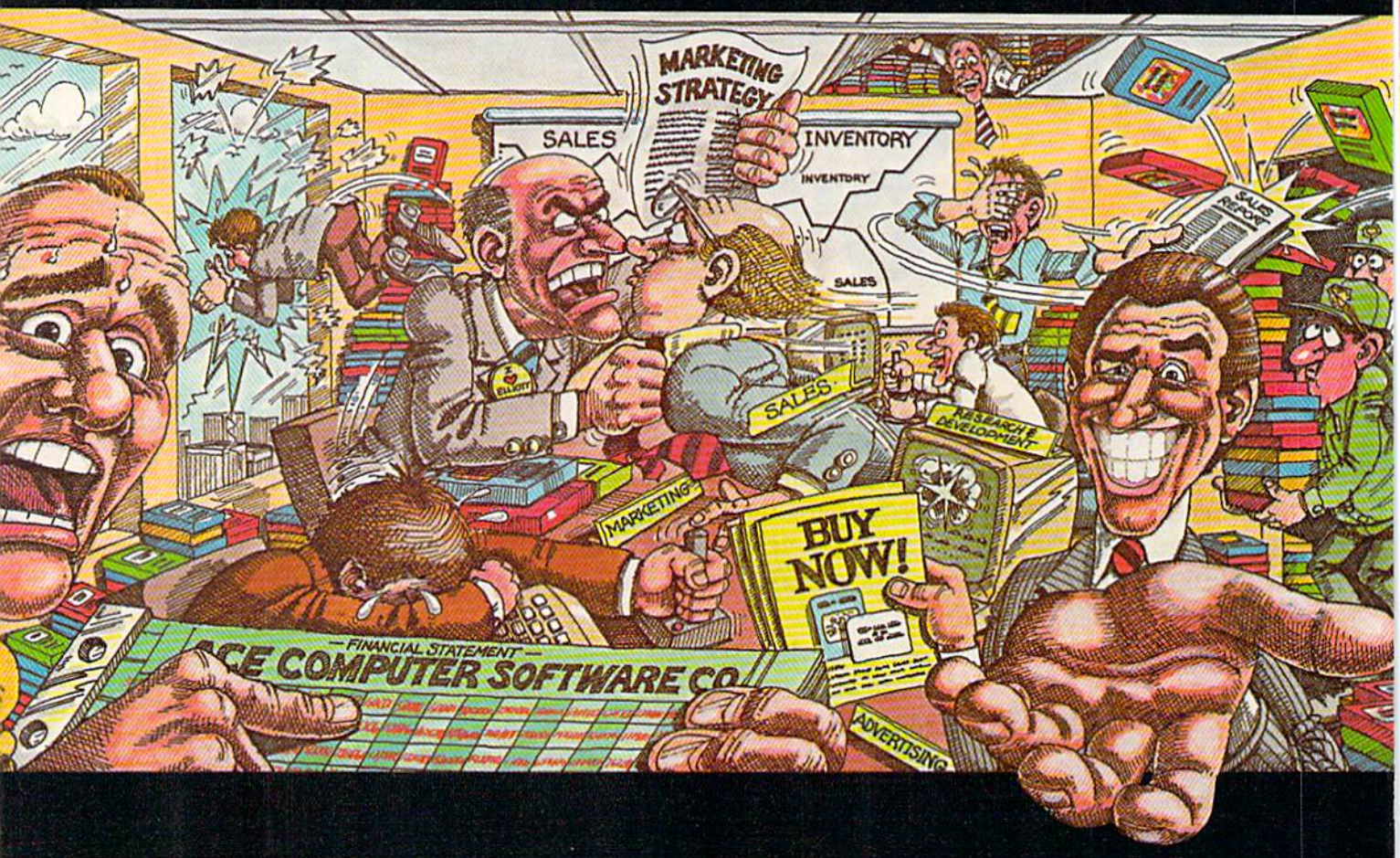

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THE EDITOR'S *notes*

I've asked Lance Elko, Gazette Editor, to contribute the Editor's Notes this month.

Robert Lock, Editor In Chief

In an upcoming issue, we'll be reporting on the Summer Consumer Electronics Show at which new Commodore products and a variety of third-party hardware and software for the VIC and 64 will be introduced. It will be interesting to see if Commodore has final versions of the 264 and the TED-16 (or C-16), a 16K version of the 264, ready to show.

Commodore plans to market various "flavors" of the 264. Some will have a built-in word processor, others will offer a spreadsheet or a built-in Logo. Commodore says that they can offer a machine with almost any application built in. This may be a little tricky to market, though. The TED-16 will be sold for under $100, and can be upgraded to a 64K 264.

The 264 and TED-16 will be marketed as a new kind of computer. Until now, most home computers have had a hobbyist slant. The 264 may be targeted to people who merely want to use a computer, not program it. (This is the same audience Apple hopes to reach with its Macintosh). The large ROM capacity will support sophisticated applications on cartridge. This may be why Commodore is apparently unconcerned by the lack of sprites and the loss of the SID sound chip. We'll fill you in on the details in a future issue.

On another subject, those of you who take the time to fill out and mail the Editor's Feedback cards probably wonder about their fate. Do they ever get read? Yes, every one of them. They're valuable to us because they establish a very useful two-way communication.

In surveying the responses we've received over the past few months, it's apparent that most readers are extremely happy with the GAZETTE. The most common responses to "What do you like best about COMPUTE!'s GAZETTE?" are: "I like the whole magazine," and "it's easy to understand."

But what do readers like least about the GAZETTE? We get a variety of answers to this question, a majority of them very specific in nature—and some contradictory. For example, "not enough for the VIC-20" and "not enough for the 64." Or, "too much educational material" and "not enough educational programs." With comments like these running nearly 50/50, it appears that our mix is meeting the needs of most of our readers.

The most common negative response until recently was "bugs." With the advent of the GAZETTE DISK and the resulting drop in typing load, we've heard much less about this particular programmer's curse. And those who continue to type in the programs have probably noticed a lower (in fact, almost nonexistent) incidence of bugs.

A number of readers have asked why we don't "grade" our reviews or "degrade" some products. Essentially, any product we review is, in our opinion, of merit. We feel that it's only worth your time and space in the GAZETTE to review products that are well designed. The market is flooded with products, and we'd rather tell you about the good ones.

While the grading of products may be helpful to some readers, it is often unfair to the product. If you've ever read reviews of records you really like, only to see a thumbs-down or a poor grade, you probably wondered if the critic heard the same thing you did. The goal of quantifying a product with a letter or number grade is to be objective, yet it's often subjective and arbitrary. If we took a poll of our staff, we'd have a number of different answers. Describing the product, how it works, and sometimes how it compares to other similar products is the most honest information we can give to our readers.

On the lighter side, some of our readers have told us that what they like least is "spinach," "people who smoke when I eat," and "lack of TI coverage." I guess they have no real complaints.

One reader asked if we plan to continue publishing quality programs ("Are there any left?"). In upcoming issues, we have slated a first-class machine language sprite editor, an 80-column simulator for the 64, some significant telecommunications software for the VIC and 64, and some other surprises.

We appreciate your comments and ideas. They're vital to the magazine, so keep them coming and, until next month, enjoy your GAZETTE.

Lance Elko
Editor

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GAZETTE FEEDBACK

EDITORS AND READERS

Do you have a question or a problem? Have you discovered something that could help other VIC-20 and Commodore 64 users? Do you have a comment about something you've read in COMPUTE!'s GAZETTE? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403.

Incomplete Disk Saves

When I save a program on my 1541, it sometimes saves incorrectly. Then, when I try to scratch it, it doesn't scratch correctly. Why am I having this problem?

Cyrus D. Bhathena

Although incomplete saves can stem from a number of problems, the problem you're having might be caused by improper closing of the saved file.

After the program is saved, the computer places a marker indicating the end of the file. This is done automatically by the operating system. However, every once in a while, a program is not properly closed. These are sometimes referred to as poison files, and if not properly attended to, can cause problems on that diskette.

To tell if the file was improperly closed, first load the directory (LOAD "$",8), then LIST it. A file that is still open will be indicated by an asterisk next to the program name, as shown here.

```
0 "COMPUTE'S GAZETTE" CG 2A
27    "PROGRAM 1"          PRG
27    "PROGRAM 2"          PRG
0     "PROGRAM 3"          *PRG
610 BLOCKS FREE.

READY.
```

If you do have an open file on your diskette, don't *scratch it. That is, do not try to purge it using the OPEN 15,8,15:PRINT#15,"S0:*filename*" command.*

The proper way to eliminate the file is with the VALIDATE command. After a diskette has been used for some time, the directory can become disorganized. This can be caused by repeated saves and scratches, which might leave many small, unused gaps on the diskette. The VALIDATE command is used to reorganize the diskette. Purging improperly closed files is part of the process.

To validate a diskette, type and enter the following command:

```
OPEN 15,8,15:PRINT#15,"V":CLOSE15
```

The disk drive should whir, spin a bit, then quit. If the diskette is full, the process may take a few minutes or so.

One important word of caution, though. The VALIDATE command will also purge random files and relative files. So, if you have any random or relative files on the diskette, don't use the VALIDATE command.

Also, there is a way to check if programs were saved properly. This is done with the VERIFY command. After saving a program in the usual way (SAVE "filename",8), type and enter: VERIFY "filename",8. The filename in both cases should be identical.

The VERIFY command compares the program in memory with the program on disk. It does this by comparing the two byte by byte, and if anything is amiss, an error will be indicated. If you get an OK after the verify, the save has been performed correctly.

Moving Sprites

I am a beginning programmer in the process of writing a game. I need to know how to move a sprite in all directions. I have referred to the *Programmer's Reference Guide,* but the instructions are vague.

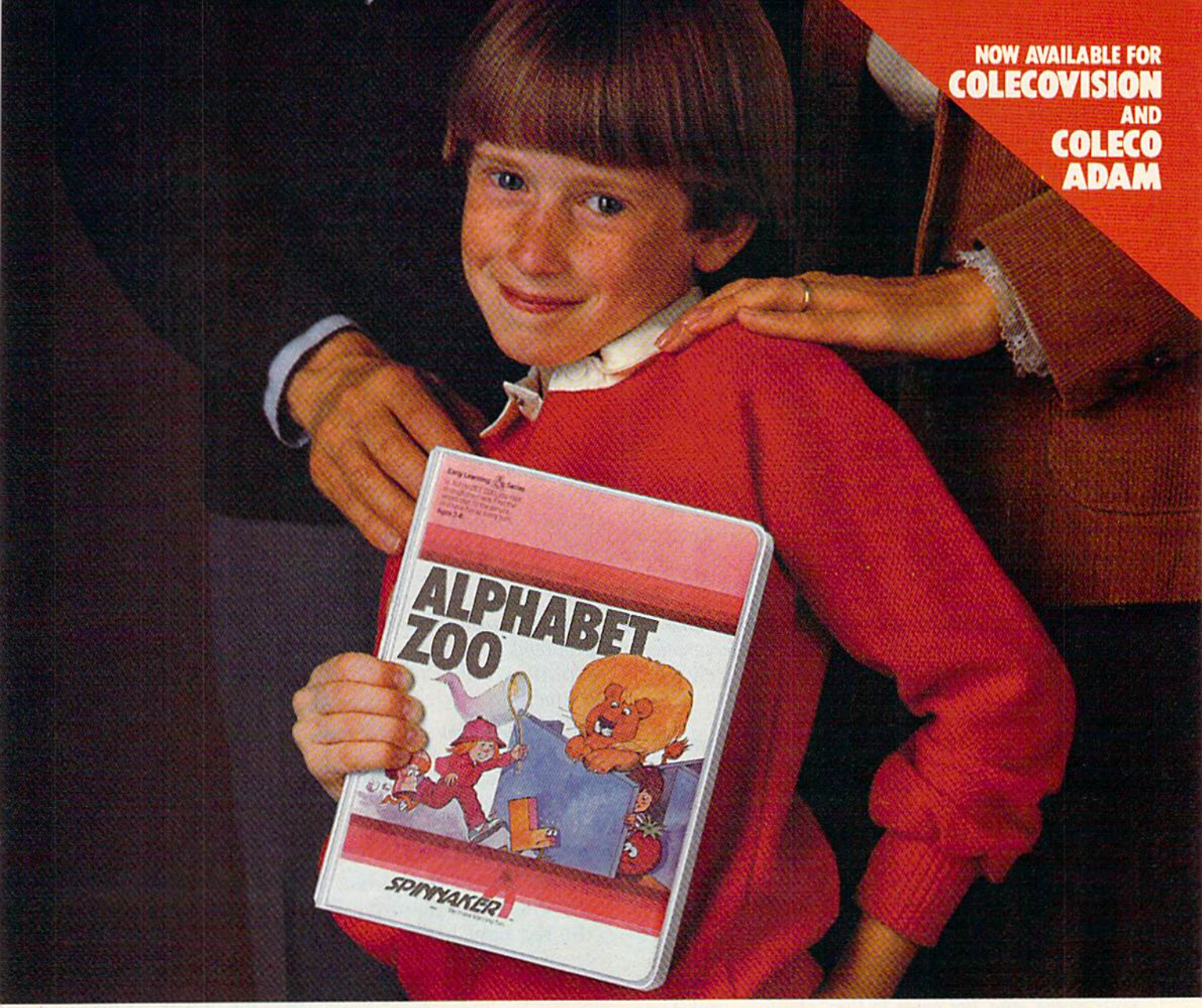
Scott Cundiff

Moving the sprites on the 64 is done by POKEing values into memory locations 53248 through 53263. These 16 bytes control the positions of the eight sprites.

Each pair of memory locations corresponds to one sprite, the first byte being the X (horizontal) position, and the second the Y (vertical) position. For example, memory locations 53248 and 53249 are the bytes for sprite 0. 53248 is for the X position, and 53249 for the Y.

As an illustration, run the following program. It allows you to input positions for sprite 0 and demonstrates how the positions are changed.

```
10 XX=53248:POKE53280,0:POKE53281,0
20 POKEXX+21,1:POKE2040,192:POKEXX+39,1
30 PRINT"{CLR}ENTER SPRITE X,Y POSITIONS"
40 INPUTPX,PY:IF PX>255ORPX<0ORPY>255ORPY
   <0THEN30
60 POKEXX,PX:POKEXX+1,PY
70 GOTO30
```



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With the program running, enter 255,100 for the X,Y coordinates. Notice that setting the X position with 255 (the maximum value that can be POKEd into a single byte) only moves the sprite about three quarters of the way across the screen.

To move the sprite the rest of the way, one more byte has to be POKEd, location 53264. The eight bits correspond to the eight sprites, bit 0 being for sprite 0, and so forth. When the bit is on (1), the sprite will be positioned on the right quarter of the screen. When it is 0, the left three quarters of the screen will be used. To see how this works, POKE 53264,1 then rerun the program.

Secret Messages

In your program called "64 Electronic Notepad" (January), there was an option to enter two secret codes, but the codes were not printed to the screen. How was this done?

Vito L. Devenere

This was done by simply changing the character color (the color of characters printed to the screen) to the same color as the screen background. Here's an example of how it's done:

```
10 POKE53280,0:POKE53281,0:PRINT"{WHT}"
20 PRINT"{CLR}{DOWN}ENTER YOUR NAME,":PRI
   NT"THEN PRESS {RVS}RETURN{OFF}"
30 INPUT"?{BLK}"; N$
40 PRINT"{WHT}{DOWN}YOUR NAME IS:";N$
```

VIC users should leave out the first two POKEs in line 10 and replace them with POKE 36879,8.

In this example, just before you are asked to enter your name, the character color is changed to black, the same as the background. You then enter your name, and the color is then changed back to white and printed.

Jumping Screens On The VIC

I've heard of many people having trouble with "jumping screens" when using a VIC on a Zenith System III TV.

Being a Zenith Dealer, I've run across this myself, and have an answer for your readers who may be experiencing the same problem.

Readers should ask their Zenith dealer or service department about a thing called a "vertical sync mode jumper." It's located on the Zenith 9-152 series module, and allows integrated vertical sync or "countdown sync."

Unplugging the 2H jumper and dressing it out of the way usually allows integrated vertical sync.

Mike Schurman

Thanks for the tip. We have, and continue to receive, many letters about the Zenith System III's incompatibility with some Commodore computers.

WordPro 3 And 1526 Incompatibility

I'm the owner of a Commodore 64 and a 1526 printer, and I'm having trouble using *WordPro* 3. It doesn't seem to work with the 1526. I've tried all of the printer arrangements, but to no avail. Do you know of a fix for this problem?

Rodney Ward

The earlier versions of WordPro 3 Plus/64 *are incompatible with the 1526 printer. A spokesman for the company stated that the problem revolves around the different internal timing of the 1526 printer. The spokesman also stated that as soon as they became aware of the incompatibility, the program was updated. The updated versions (now being offered) should work with the 1526.*

As for those of you who have the old version, don't despair. On request, Professional Software will send you an update program. This should solve any problems you may be encountering while using WordPro 3 *with the 1526. For further information, contact:*

Professional Software Inc.
51 Fremont St.
Needham, MA 02194
(617) 444-5224

Spinning Disks

I have a 1541 disk drive. Is it OK to remove the diskette while the drive is still spinning but after the red light has turned off?

Dwight A. Albright

A Commodore representative says it's best to let the drive stop spinning first. Although the read/write head is disengaged when the door is opened, the spinning drive may still present a problem.

Opening the door and removing the diskette while the drive is turning could do damage. Pulling the diskette across the spinning hub—the part that spins the diskette—could do damage.

All in all, it's safer to wait those few extra seconds and let the drive stop before opening the door.

Cloning Joysticks

Is it possible to use an Atari-type trackball on the VIC? Both computers seem to have the same type of plug.

Joe Wiebe

Yes, it is. Both the Atari computers and the VIC and 64 have the same type of nine-pin joystick plugs. Atari trackballs and joysticks work fine on the VIC or the 64—and vice versa. Atari paddles can also be used on the VIC or 64, but they won't be as responsive as Commodore paddles.

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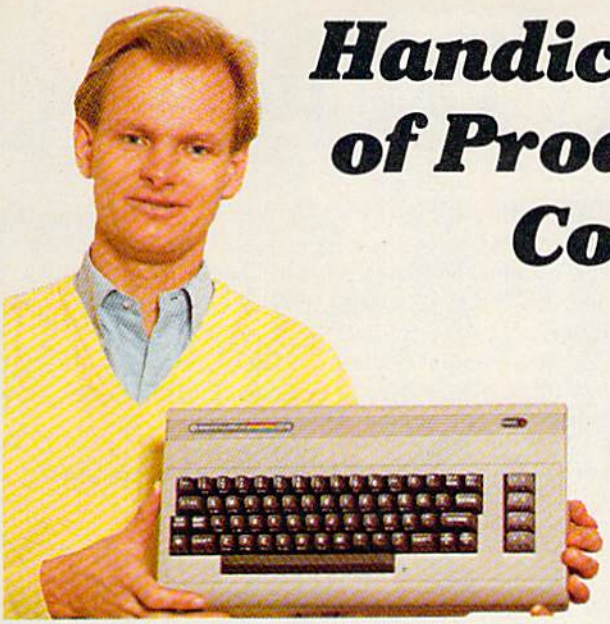

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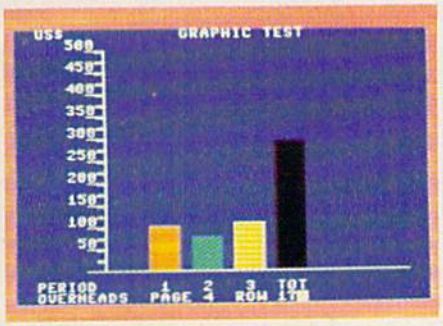

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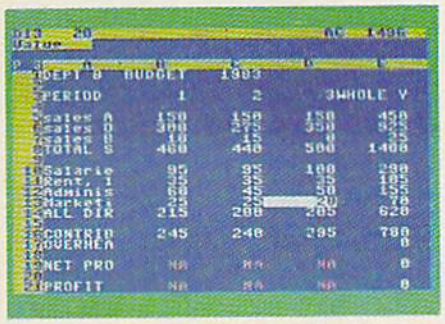

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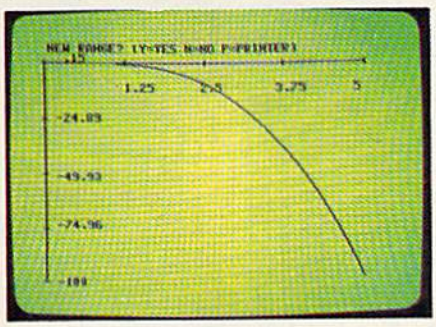

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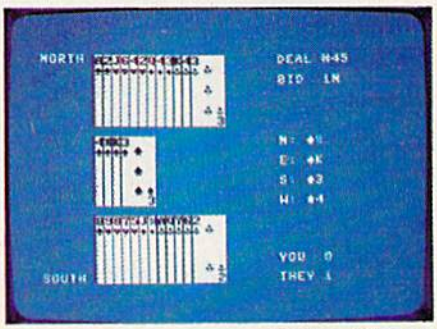

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User Group Update

Changes

The new address of the Mid-Missouri Commodore Club is now 780 East Park Lane, Columbia, MO, 65201, (314) 474-2868. Contact person is Jim Whitacre.

The VIC Software Development Club of Sewell, NJ, is no longer in existence.

The new address for the 64 Club in Baton Rouge, LA, is 5200 Corporate Blvd., Baton Rouge, LA, 70808, (504) 925-5870. Contact person is Tommy Parsons.

The Southeast Houston (TX) VIC User Group is no longer in existence.

The address for the C-64 User Software Exchange Resources (U.S.E.R.S.) is P.O. Box 4022, Rochester, NH, 03867. No calls, please.

The new contact person for Eight Squared in Mt. Holly Springs, PA, is Mindy Skelton. The new telephone number is (717) 486-3274.

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Chico, CA 95927
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Rocky Mountain Commodore Club
Ray Brooks
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Commodore Users Group of Stratford
Dan Kern-Ekins
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Newark, DE 19711
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The Commodore Advantage
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Dept. of Industrial Arts & Technology
State University College
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Commodore SIG Computer Club of Rockland
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Mohawk Valley Commodore User's Group
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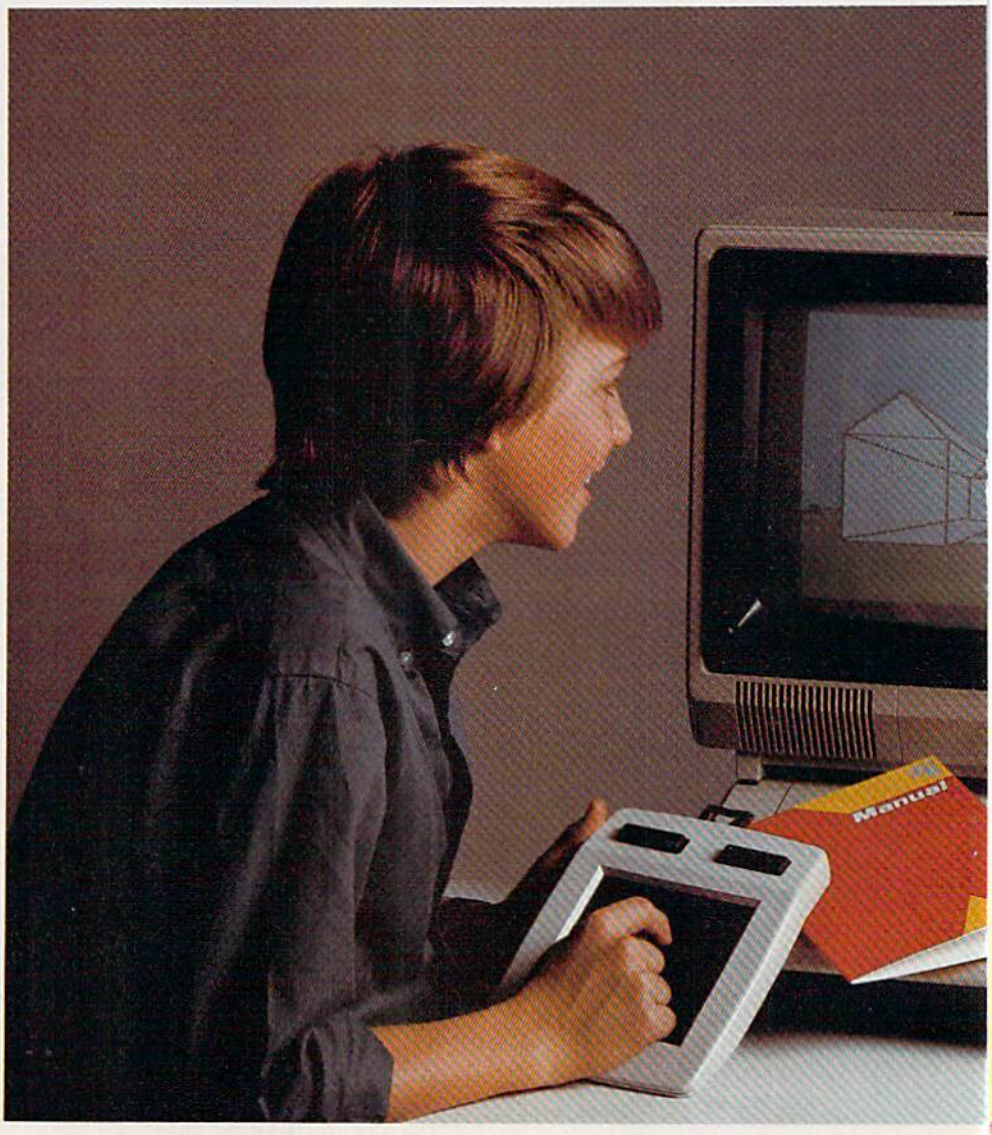
In Touch With Your Computer:

Graphics Tablets And

Kathy Yakal, Editorial Assistant



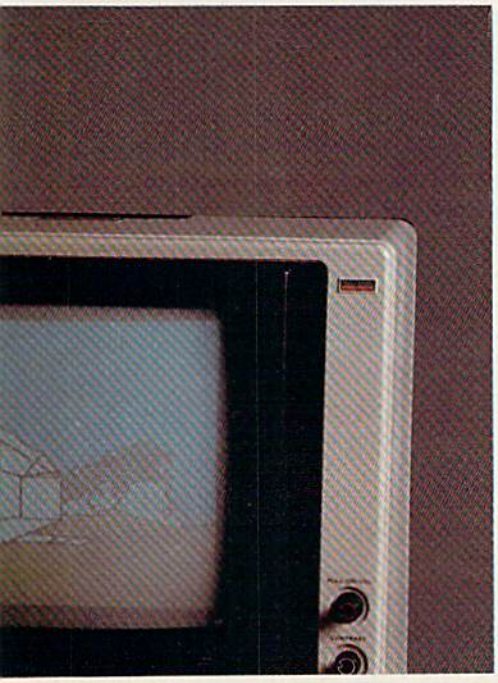
How many times have you wanted to jab a finger at your computer screen to indicate your choice from a menu? Or, after hours of trying to finish the title screen of a game have you been tempted to take a magic marker and draw in the curling tail of the sea monster whose detail eludes you? New input devices—graphics tablets and light pens—make that kind of interaction with your computer possible.

Think of the first time you ever saw an illustration on a computer screen, then looked at the program listing that created it. You may have been overwhelmed by the pages and pages of DATA statements and foreign-looking code that it required.

On the other hand, you may have been under-whelmed, thinking that so many lines of commands could surely produce something a little more impressive than a crude-looking spaceship being chased by what looks like Chicken McNuggets.

However seasoned the programmer, creating detailed illustrations in a program still takes long hours, a good amount of programming knowledge, and plain hard work. The reason is

Light Pens



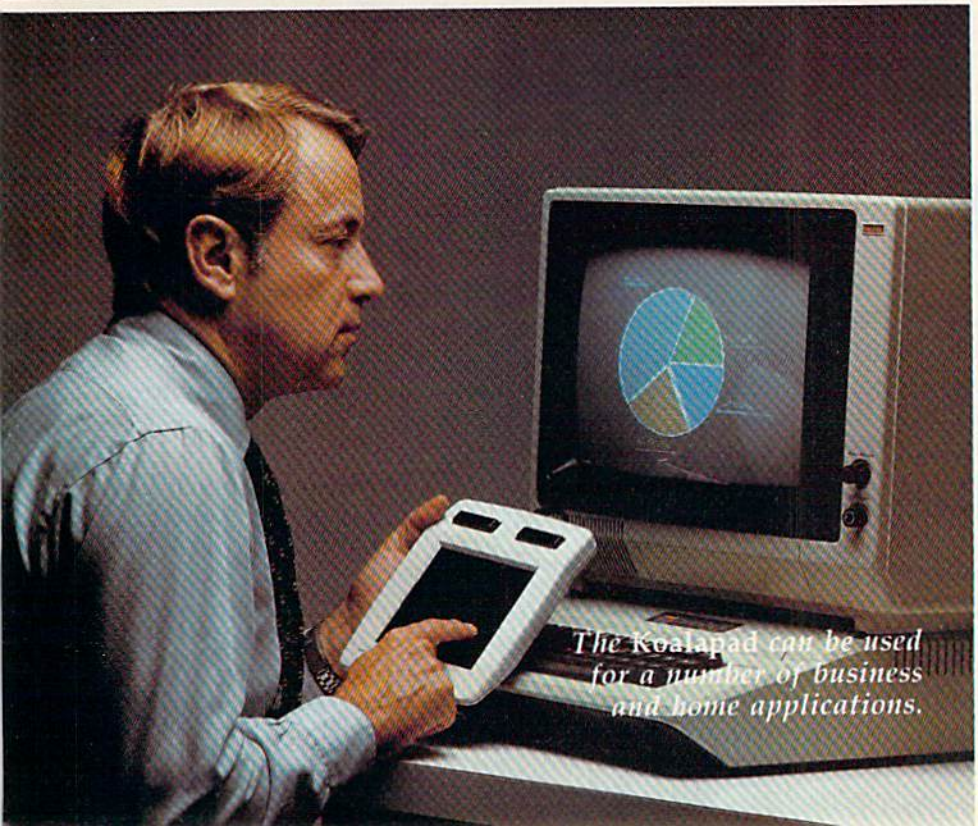
that, until recently, the only way to communicate with computers was by typing in the correct combination of numbers, letters, and symbols on the keyboard.

New input devices—graphics tablets and light pens—have changed that.

Technically, these devices are not new. Some have been used for years in higher-level applications by people like industrial designers. And though they haven't exactly flooded the home computer market, consumers and software publishers are beginning to take notice of their potential applications.

Graphics tablets and light pens, like the keyboard itself, are simply input devices, ways for you to communicate with your computer. Instead of typing in a command or moving the joystick back and forth, you touch your finger or a stylus to the surface of the graphics tablet, or point the light pen at the desired spot on the screen.

What that desired spot is depends on the kind of software you're using. Graphics tablets and light pens, in tandem with the appropriate software programs, can basically do two things: draw pictures and select options in menu-driven software.



The Koalapad can be used for a number of business and home applications.

Any discussion about graphics tablets and light pens without an almost simultaneous discussion about software is useless. These input devices make no sense without software. So let's walk through our first few minutes with a graphics tablet. We'll use the *PowerPad*, by Chalkboard, as our example.

The *PowerPad* is probably the largest graphics tablet around. The pad itself measures 12 x 12 inches; its housing brings the total dimensions to 20 x 17 inches. One end of the cord is inserted via a modular

phone-type jack into the pad; the other end plugs into port 1 on the Commodore 64.

Once everything is connected and the computer turned on, it's time to load some software. Chalkboard currently offers 14 different packages.

Using a PowerPad *and* MicroMaestro *software, this child can compose and play music.*

Called *Leonardo's Library*, this series offers learning in a number of subject areas, like music, mathematics, visual arts, science, language arts, and social studies applications.

Each program comes with a Mylar keyboard overlay which, depending on the software, turns the *PowerPad* into an artist's canvas, a piano keyboard, a LOGO-language package, even a programming kit to create new software using the *PowerPad*.

Let's load a music program, *MicroMaestro*. The overlay contains a partial keyboard, a musical staff, and several command notations. The computer screen looks similar; it, too, shows a keyboard and staff. To compose music, simply touch the notes you want on either the keyboard or staff on the overlay. *PowerPad*'s unique multisensor technology (the pad can sense and respond to more than one touch at a time) lets you create harmony.

MicroMaestro does not force you into a strict 4/4 time. It remembers pauses and syncopation, playing the music just as you composed it.

But what's probably most exciting about touch tablets is their graphics applications. You may have seen examples of art programmed on a computer, but those high-tech masterpieces require a tremendous amount of programming skill and artistic ability. Not many of us have those qualities, especially in that combination.

Graphics tablets bring computer-generated art to the masses. They can't necessarily make someone a better artist, but they provide a different medium for anyone who likes to do a little drawing now and then—maybe even entice someone who is not prone to doodling.

One of the initial software packages produced for Koala Technologies' *Koalapad* is *KoalaPainter*, a comprehensive painting, drawing, and graphics program. After drawing a picture, you can choose from several colors and textures to fill in different areas of the illustration.

Kids' stuff? Not entirely. Granted, bypassing the keyboard opens up computing to a much younger set. But graphics tablets can be used to move text in a word processing program, design a spreadsheet or bar graph, create patterns for wallpaper and fabrics, even map out floor plans for buildings. The *Koalapad* can be programmed to operate as a set of up to 36 special function keys with custom overlays, which makes it possible to run business and financial programs without using a traditional keyboard.

Though drawing pictures on a graphics tablet may come quite naturally, some people criticize them because of the spatial problem: You have to keep looking back and forth from the tablet to the screen.

Light pens allow you to interact directly with the screen. Like graphics tablets, they're used to draw and point, but the drawing and pointing are done directly on the surface of the screen. "The good thing with a light pen is that you can see what you're doing," says Matthew Hock, a software designer for Futurehouse, manufacturers of the *Edumate Light Pen*.

A light pen looks much like an ordinary pen with a cord attached that plugs into a user port on the computer. Some have "switches," buttons that must be pressed to activate the light pen. Others require that you hold down a key on the keyboard.

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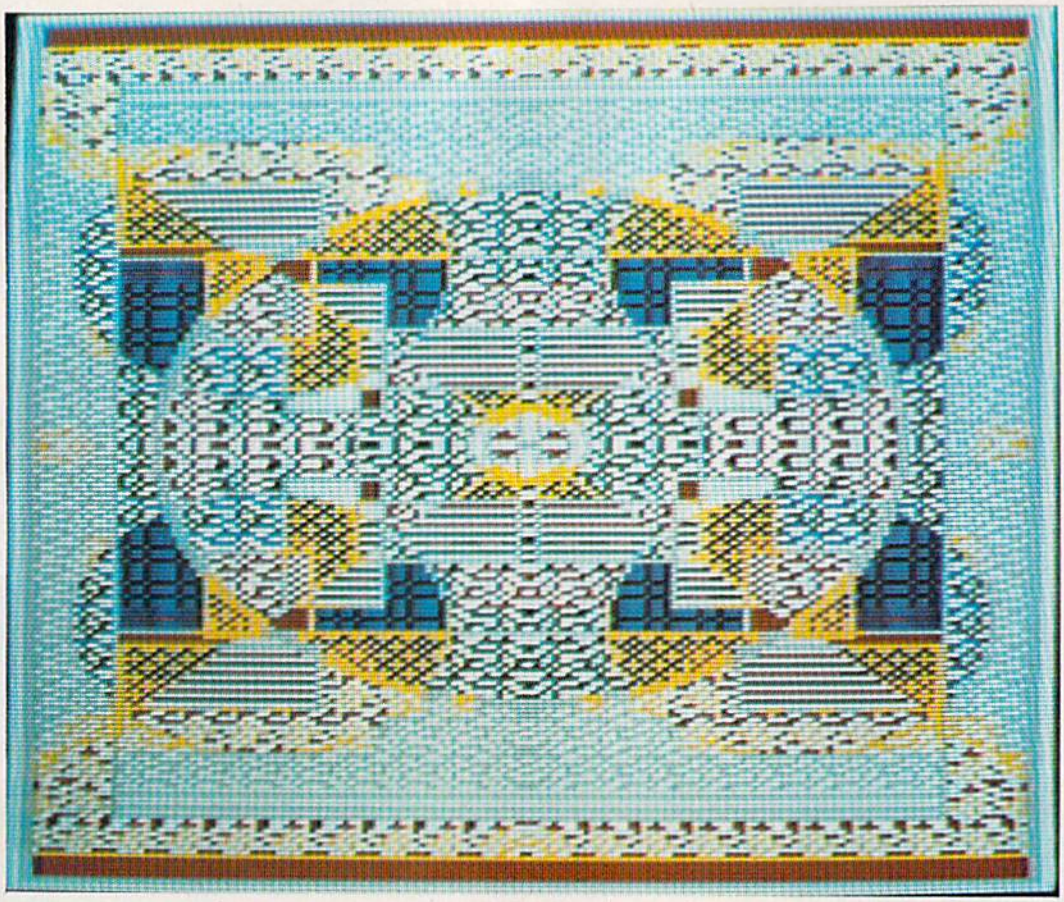


This illustration was drawn using the Edumate Light Pen *and Futurehouse's graphics package,* Peripheral Vision.

Like graphics tablets, light pens have many home and business applications. They're especially appropriate for choosing options in menu-driven software. But some of the graphics software that's been designed for them may lure even the most unartistic person to draw a picture of her black cat and see what she would look like with a paisley coat.

Futurehouse, Inc., has developed such a package. Called *Peripheral Vision*, it is an advanced graphics package that can be used with the *Edumate Light Pen*.

Peripheral Vision works much like graphics software for touch tablets. Banners illustrating user options run across the top and bottom of the screen. To select an option, you touch the light pen to it, then move to the drawing portion of the screen to start your illustration.

If you just want to do a freehand drawing, you first select one of six brush stroke widths, pick up one of the 15 different colors, and draw. If you want to fill in your picture, you can pick up one of the 35 predefined textures (or create your own) and touch the light pen to the area you want filled in. It's not necessary to move the pen back and forth, like you would if you were painting with a crayon or paintbrush: The area fills in automatically.

For more advanced designs, *Peripheral Vision* offers several options. The zoom feature allows you to focus on a very small space and design very intricate detail. If you need very exact circles, triangles, rectangles, or even straight lines, *Peripheral Vision* lets you set the defining points, then draws them for you in perfect geometric shape. There's even a mirror mode, in which everything you draw will be mirrored in a horizontal and vertical direction for a kaleidoscope effect.

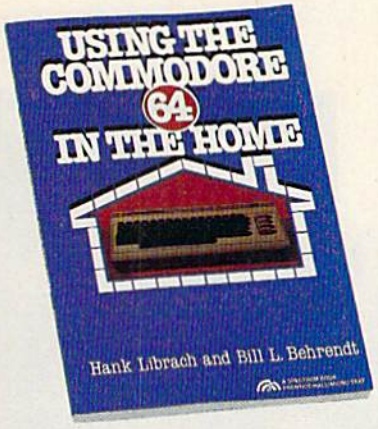
When you've completed your design, you can save it to disk or make a printout.

If you're interested in experimenting with a graphics tablet or light pen, you're pretty much restricted to software packages published by the manufacturer of whichever one you purchased. Here again, compatibility is the real bugaboo. The makers of graphics tablets and light pens are expanding their own lines of software, but there have not been any major steps in the direction of standardization for these new input devices.

If the market responds favorably, software packages may someday have stickers that say, "For the Commodore 64. Graphics Tablet or Light Pen Required."

Prentice-Hall speaks a Commodore language other publishers have forgotten.

English.*



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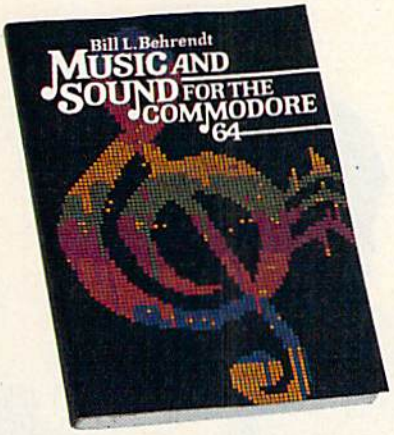

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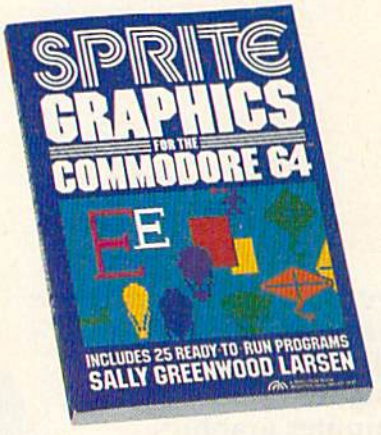

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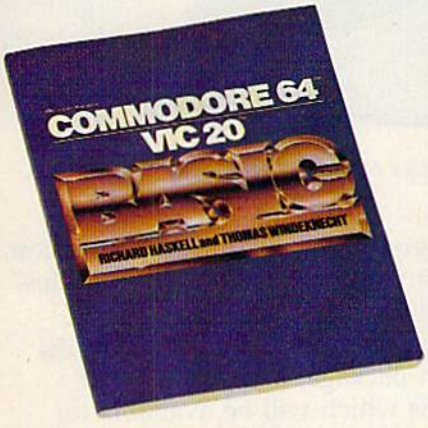

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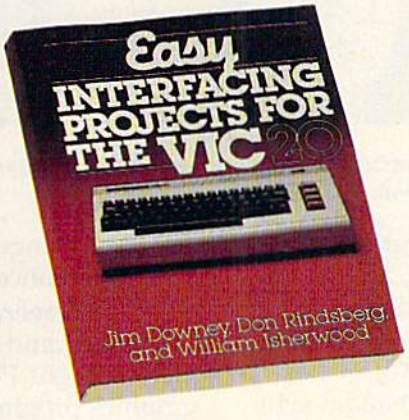

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Steven Gibson
The Designer Behind The Gibson Light Pen

Selby Bateman, Features Editor

Steven Gibson is writing a name for himself—in lights—as a leading designer of microcomputer graphics software. With his new Gibson Light Pen System, the 28-year-old programmer appears to have another winner.

Steven Gibson demonstrates some of the graphics capabilities of his Gibson Light Pen system, available for the Commodore 64 this summer.

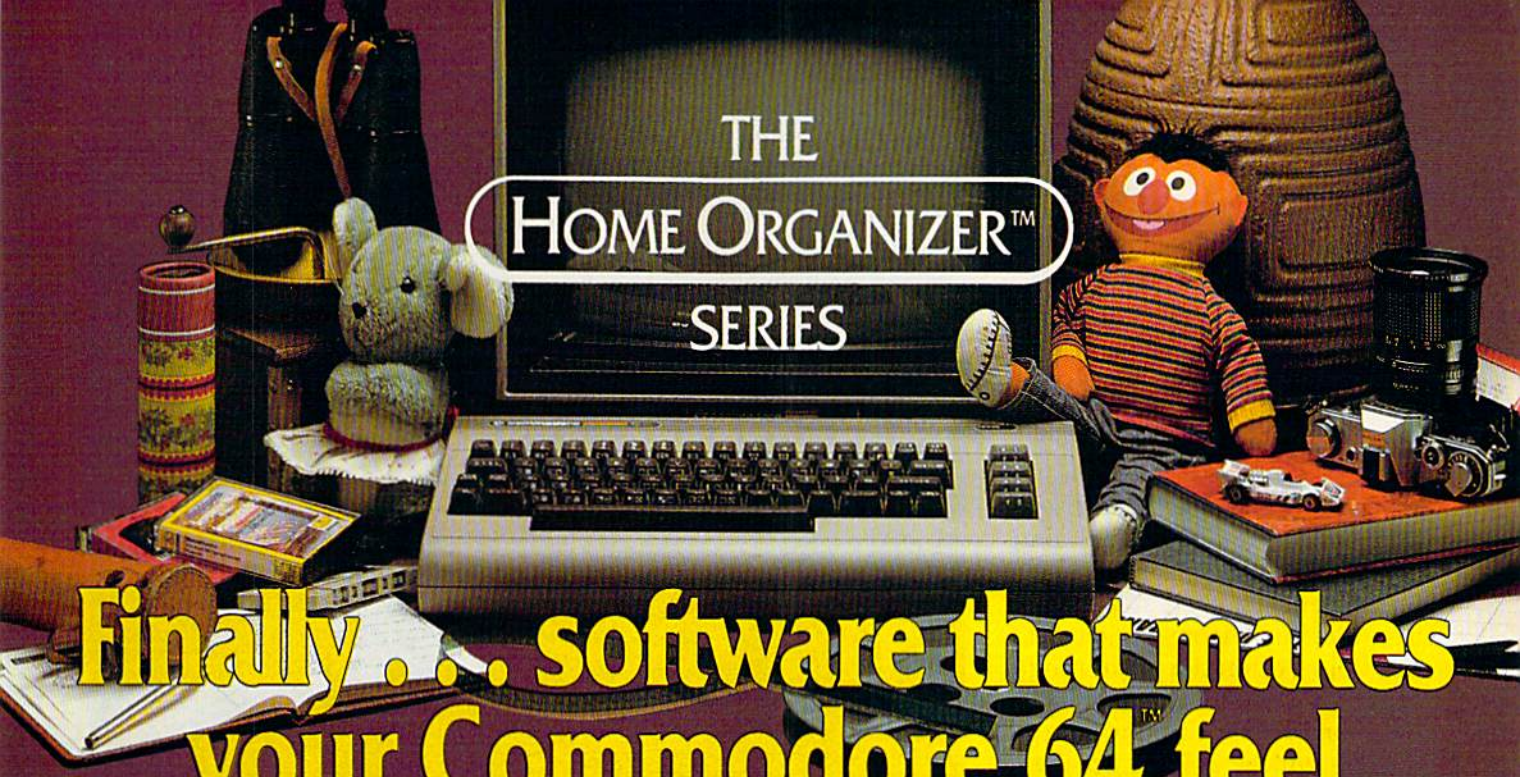
Steven Gibson leans back in a deck chair, gazing absently at the ceiling, and a smile breaks out from under his neatly trimmed moustache.

"I was sitting one morning in a JoJo's Restaurant, thinking about how I could handle symbols. And suddenly this idea of overlapping cards hit me. On a napkin, I drew four overlapping squares. I said, 'Ahhh, that's it!'"

Gibson stretches forward suddenly; his gaze more focused as he recalls this particular step in the development of his new light pen system. "I *ran* back to the office. And because of the Pentrack Language I had written as a foundation, I had the concept working in about ten minutes."

The screen card-selection format Gibson developed and refined is but one feature in the Gibson Light Pen package, a versatile set of graphics programs which will be available for owners of Commodore 64 computers by mid-July.

First demonstrated last January at the Winter Consumer Electronics Show (CES) in Las Vegas, the Gibson Light Pen attracted immediate attention. Gibson perched on a raised platform as computer dealers and members of the press



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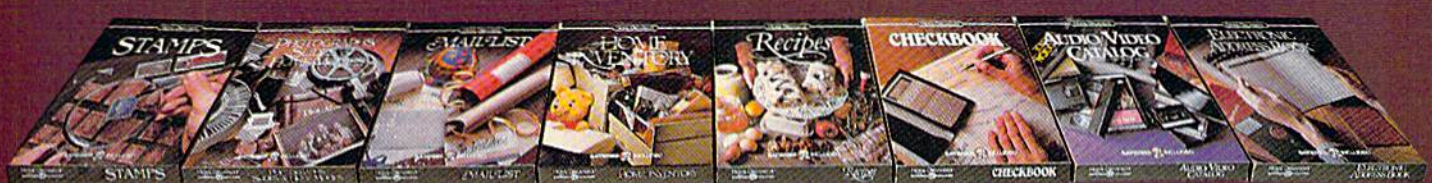

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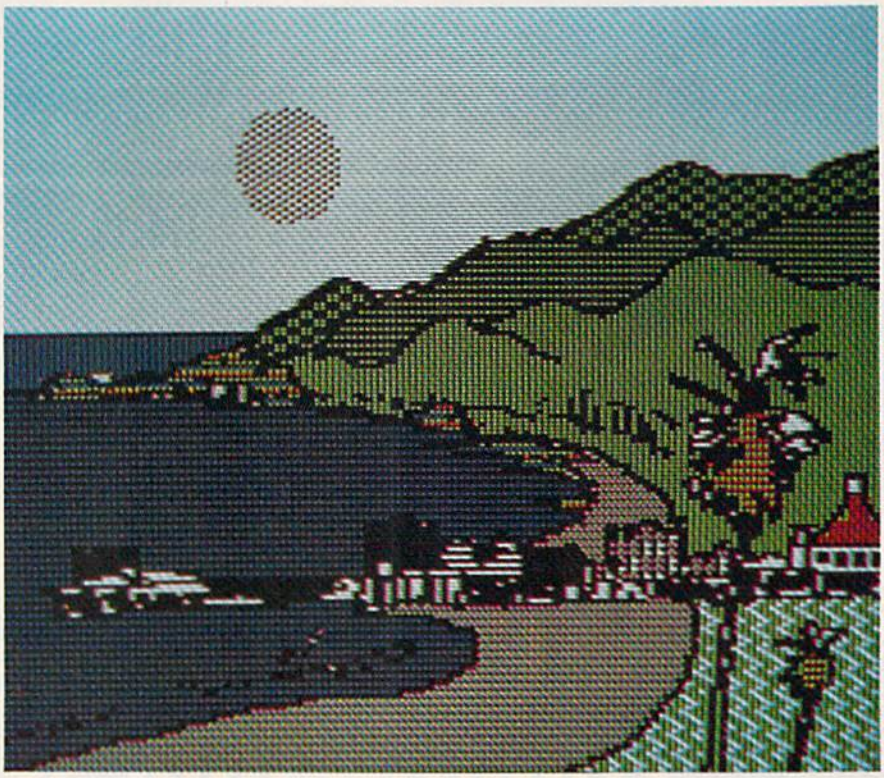
crowded around to watch him put the system through its paces on an Apple computer.

Wielding the small, black pen, Gibson quickly drew several floor plans on the screen with one piece of the system's software. Later, he made sketches, duplicating several designs and magnifying others for detailed refinement. At each step, easy-to-understand icons—pictorial symbols—offered a wide range of directions and options.

For $99.95, Commodore 64 owners will be able to get the light pen; the Pentrack Language System, a graphics programming language; and three software packages:



The Gibson Light Pen System allows you to grid draw, stipple, cross hatch, and create patterns with geometric figures on a color palette, among other features. It will be available for the Commodore 64 by mid-July.

- *Pen Painter*, a color graphics program featuring free-hand drawing, elastic geometric shapes, and color-fill patterns. The software features Macintosh-style icons.

- *PenAnimator*, an introduction to animated computer graphics, which allows you to create up to 20 frames of animation that can run on your computer screen fast enough to produce the sensation of motion.

- *PenMusician*, an introduction to music composition, which lets you set, edit, and play back notes on a musical staff by using the light pen.

Koala Technologies, which markets the package, also plans to release another Gibson Light Pen program for the 64 later this year, called *PenDesigner*. This is a black-and-white line-art program for technical or business-oriented graphics, which will let you develop floor plans, engineering diagrams, flow charts, and landscape architecture. The software supplies templates, with such images as furniture, bushes and trees, and engineering symbols, which may be moved, saved, and magnified for detailed work.

Gibson has been working with light pens for some time. He developed the first Apple-compatible light pen in 1980, and has since created a light pen for Atari. The new Gibson Light Pen System is already available for the Apple II family and IBM's PC and PCjr.

Gibson is surprised at how far graphics software has come in just the last five years, despite the fact that much microcomputer hardware has stayed relatively the same.

"Which to me means that the determining factor has been how high do you want to reach? What are your expectations? What are users satisfied with? We could have done five years ago what we're doing today, but we just didn't know how. We were just not sophisticated.

"To some degree, it's been a matter of learning the machines better. And on the newer machines—the Commodore 64, the Atari—there *is* more powerful hardware, which gives the programmer more to work with," he says. "But in general, it seems that it's more of a philosophical difference that has occurred and which really sets the pace for what kind of applications software gets written."

The development and growing popularity of icon-based software menus in place of the traditional text-based formats delights Gibson. "Using icons is an intuitive way of working. You don't have to remember what L stands for, or what R stands for. There's a little picture of it there, a little line or rectangle or circle or whatever.

"Those are breakthroughs. Like pop-down menus, where you see, for example, the word color. You touch the word and, bang, below it

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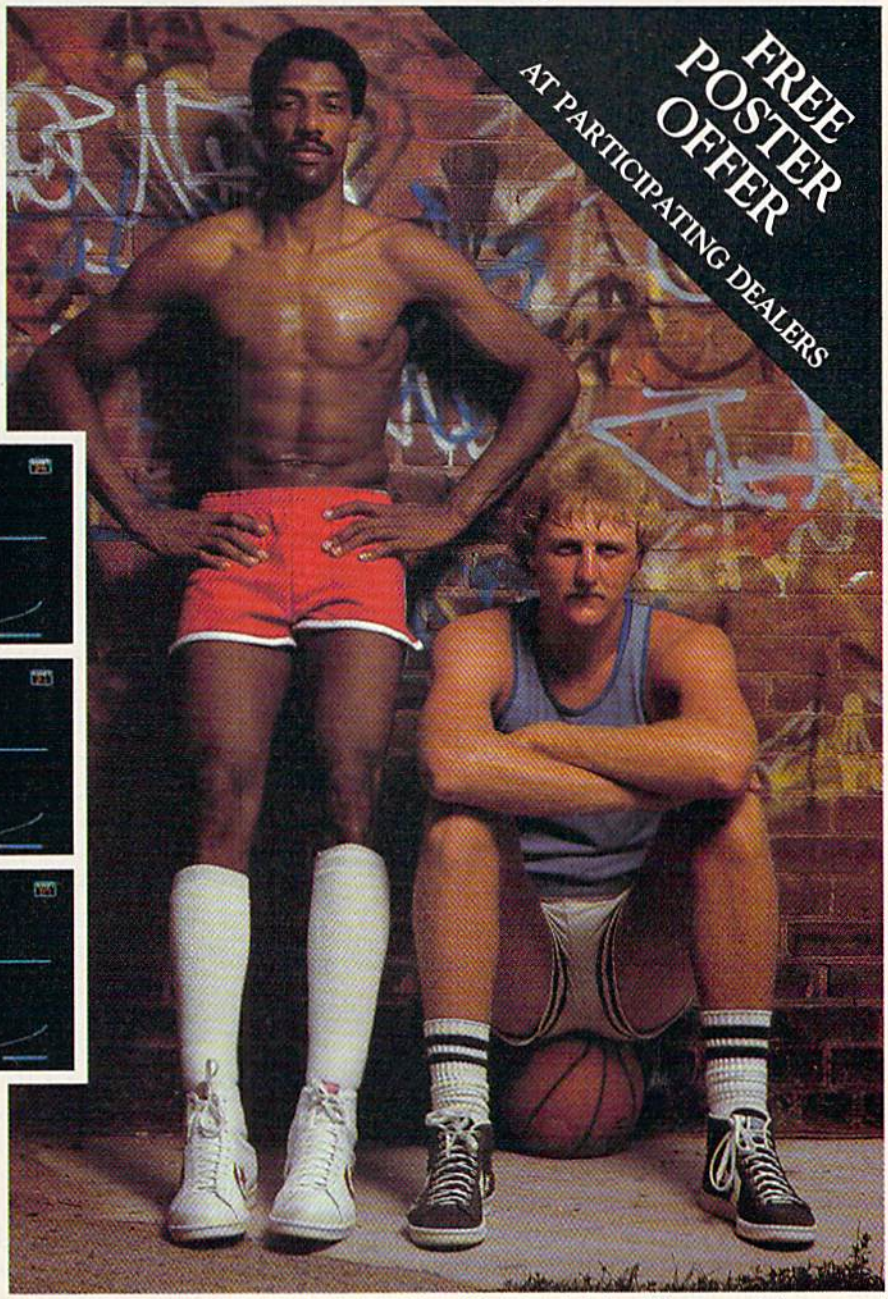

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appears a list of colors. You then select a color and you're done. As opposed to having to remember, let's see, blue-green is BG," he says.

Gibson attended the University of California at Berkeley and now makes his home in Irvine, California. Before signing an exclusive agreement with Koala Technologies for the light pen system, he owned and directed Gibson Laboratories through which he produced and sold light pens. Gibson closed the laboratories when the headaches of business management began overshadowing his software development.

"We manufactured and sold four thousand light pens for the Apple computer over the course of a year or two. Koala made five thousand the first month!" Gibson says with a shake of his head. "I was so busy deciding how many rolls of toilet paper to buy, and answering the phone and opening the mail. Even with just 15 people, you start having political squabbles. You know, these people won't talk to those people—and I'm not a baby-sitter.

"So I went out and found the best company, which happens to be Koala, to take over my pens," he says.

Freed from administrative duties, Gibson is able to spend the necessary time developing software he really wants to see people use. "The market is so much bigger today than it used to be, by virtue of the fact that there is a large installed base. So a programmer such as myself doesn't mind spending six months doing a knockout piece of software.

"I'm in a competitive marketplace, so I've got to beat the other guy's package," he says. "And things like ease of use, friendliness, how quickly you can learn it, and would my mother be able to use it are real determining factors."

Gibson is well aware of the limitations even today's more powerful microcomputers put on programmers who compete in the commercial software market. All of Gibson's work is written in machine language. "The machines today are just not powerful enough to really do much within a high-level language. As soon as you start using BASIC or Pascal, as much as it's a wonderful environment to program in, you don't get the performance.

"And some other guy is going to come along, like a Bill Budge, and write that same thing in machine code and blow out of the water anything written in a high-level language. You need to program in machine code to get the performance."

He doesn't hesitate to call himself a software artist, and dismisses those who criticize computer art.

"I have no problem with the designation of software artist. I firmly believe that it's possible to give a piece of myself to my customer, to almost have my personality in the product," he says. "Features and creativity can be conveyed. And I think when you start giving the buyer of your product a piece of yourself, that's what creates the real designation of artist."

What's the best way for computer users to find the graphics software they will want to use at home or in the office? Get a demonstration before you buy if at all possible, Gibson advises. Look at its capabilities and decide if they really show you what you need to use.

One of the most important functions to have in graphics software—in fact, for any software—Gibson calls the "Undo" feature.

"Anything the user does, he can go, 'Oh shoot. That's not what I wanted.' He pushes the Undo button and it steps backward. Koala has that on its software; it's called an Oops button on the menus," says Gibson.

"In my case [with the Gibson Light Pen], the ability to refill a pattern is an Undo. You can have an explicit Oops feature or it can be built intrinsically into the software so that it's easy to recover from any mistake you make. In other words, it just exists as a part of what makes the system easy to use, fun, and relaxing."

Gibson credits software designer Bill Budge, who created the acclaimed *Pinball Construction Set* for Electronic Arts, with being one of the most creative forces in microcomputer software development.

"Electronic Arts has taken a very high visibility. approach toward popularizing its artists. And they've generated a great deal of PR," Gibson says. "I think Budge has repeatedly demonstrated innovation in his work. *Pinball Construction Set* was a beautiful piece of work."

That is the sort of creativity, inspiration, and program depth Gibson says he's tried to bring to the Gibson Light Pen System.

Gibson has moved his programming efforts into the area of computer animation, and is even thinking of developing hardware that will enhance the computer's capability to handle animation.

He laughs good-naturedly at his present hectic pace. "I can guarantee you that you haven't seen the last of me."

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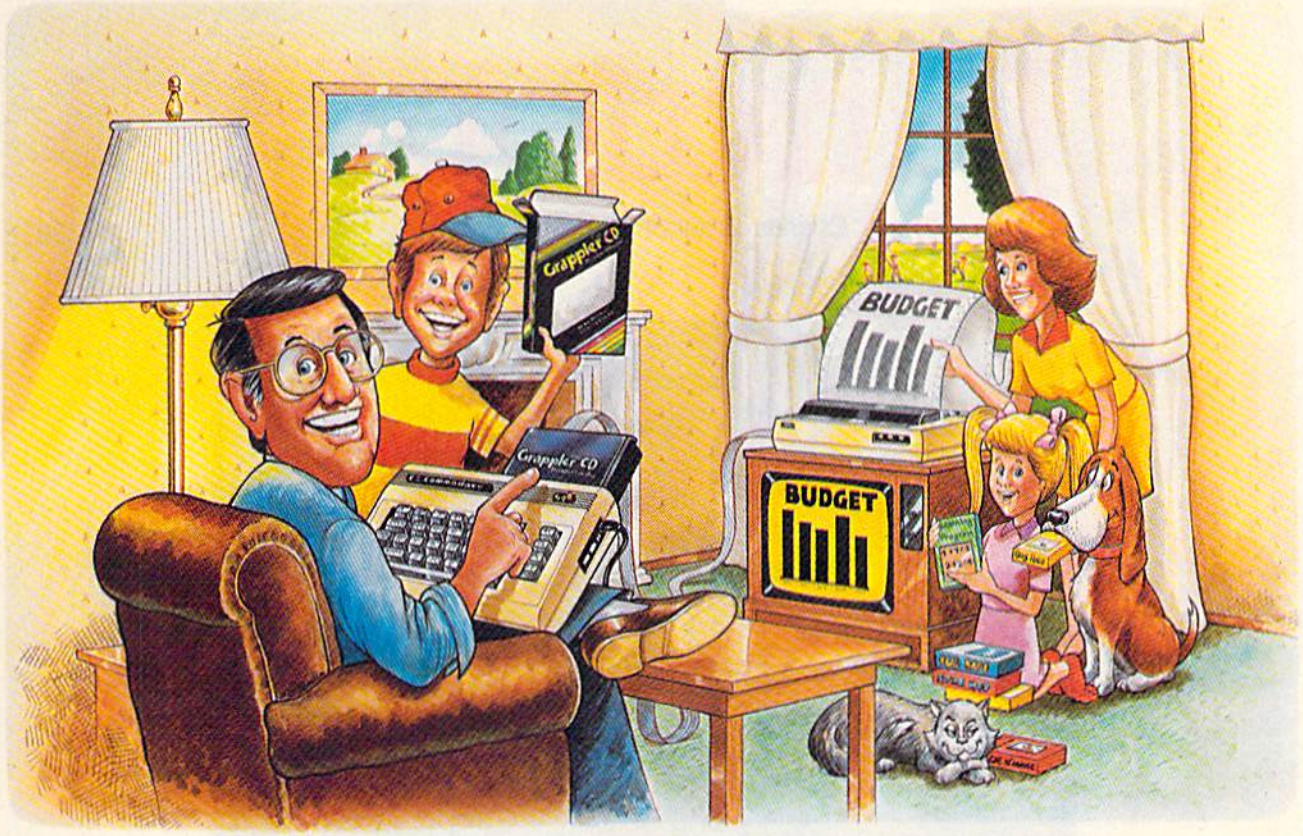

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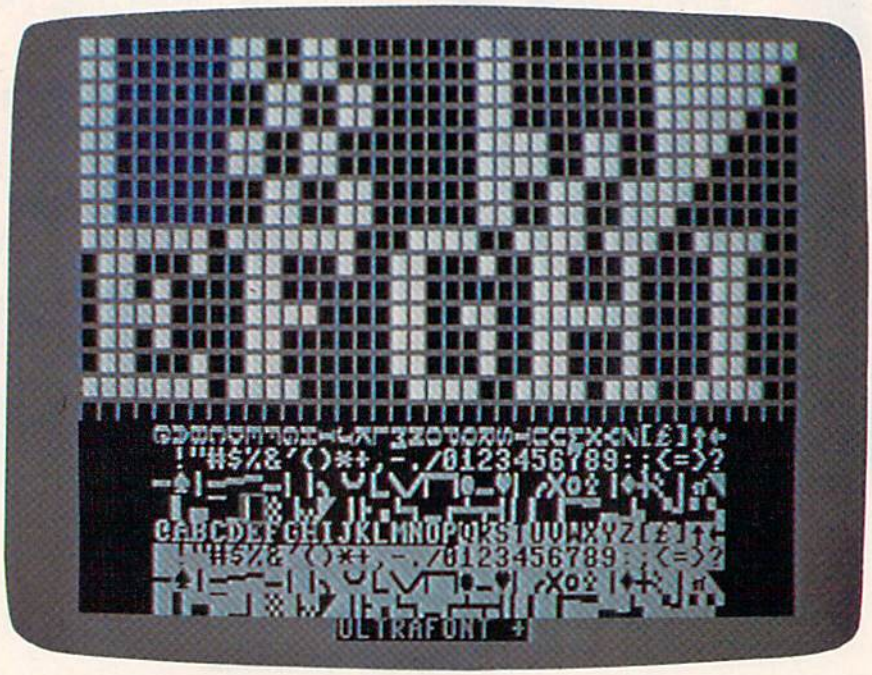
Charles Brannon, Program Editor



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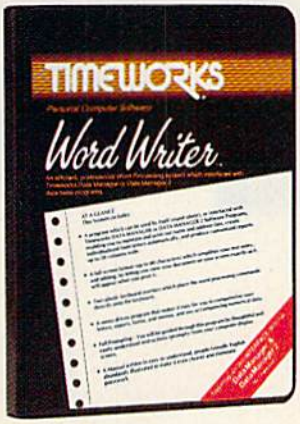

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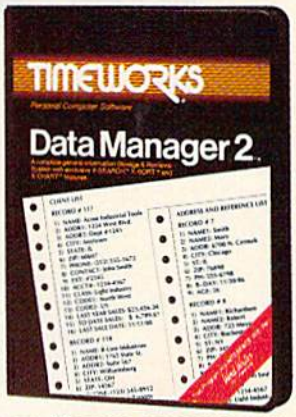

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Typing It In

Ultrafont + is written entirely in machine language, giving you speed and efficiency that BASIC can't match. While this gives you a product of commercial quality, it does carry the liability of lots of typing. The program is actually rather short, using less than 4K of memory at hexadecimal location $C000 (49152), which is reserved for programs like this one. Therefore, you don't lose one byte of BASIC programming space.

However, 4,000 characters require three times as much typing, since each byte must be represented by a three-digit number (000-255). With that much typing, mistakes are inevitable. To make things manageable, we've prepared Ultrafont + to be typed in using MLX, the Machine Language Editor. Full instructions are provided in the MLX article in the back of the magazine. So, despite the typing, rest assured that a few afternoons at the keyboard will yield a substantial reward.

Once you've entered, saved, and run MLX, answer the two questions, starting address and ending address, with 49152 and 52367, respectively. After you've saved the program with MLX, you can load it with LOAD "filename",1,1 for tape or LOAD "filename",8,1 for disk. After it's loaded, enter NEW, then SYS 49152. This command runs the machine language program at $C000 (12*4096=49152).

The Display

After you SYS to Ultrafont +, you should see the work area. At the bottom of the screen are eight lines of characters. These are the 256 characters you can customize, arranged in eight rows of 32 characters. A flashing square is resting on the @ symbol, the home position of the character set. Above the eight rows is the main grid, a blown-up view of ten characters. The last row of the screen is reserved for messages. The first time you SYS 49152, you'll be asked whether you want to edit the uppercase/graphics character set, or the lowercase set.

About The Grid

The grid is like a large-size window on the character set. You see the first five characters and the five beneath them. A large blue cursor shows you which character you are currently editing, and a smaller flashing square is the cursor you use to set and clear pixels in order to draw a character.

Moving Around

You can use the cursor keys (up, down, left, right) to move the large blue cursor to any character you want to edit. If you move to a character not on the large grid (out of the window), the window will automatically scroll to make the character appear. You can also look at the bottom of the screen to move the larger cursor, as the flashing square on the character set moves with the main grid.

The HOME key moves the small cursor to the upper-left corner of the screen. If you press it twice, it will take you back to the top of the character set—to @.

A joystick (plugged into port 2) moves the small cursor within the grid. If you move the cursor out of the current character, the blue cursor will jump to the next character in whatever direction you want to move. The display at the bottom will adjust, and the grid will scroll as necessary. This means that you can ignore the traditional boundaries between characters, and draw shapes as big as the entire character set (256 x 64 pixels—a pixel is a picture element, or dot). You can still edit one character at a time, or make a shape within a 2 x 2 box of characters.

The fire button is used to set and clear points. When you press fire, if the cursor is resting on a solid square, it will be turned off. If the square is off, it will be turned on. If you hold down fire while you move the joystick, you can stay in the same drawing mode. If you set a point, you will continue to draw as you move. If you clear a point, you can move around and erase points all over the screen.

If the drawing cursor is too fast or too slow to use, just press V to set the cursor velocity (speed). Answer the prompt with a speed from 0 (slow) to 9 (too fast for practical use).

Manipulations

There are several functions that affect the current character (where the blue box is). You can rotate, shift, mirror, reverse, erase, replace, and copy characters. The best way to learn is to play with

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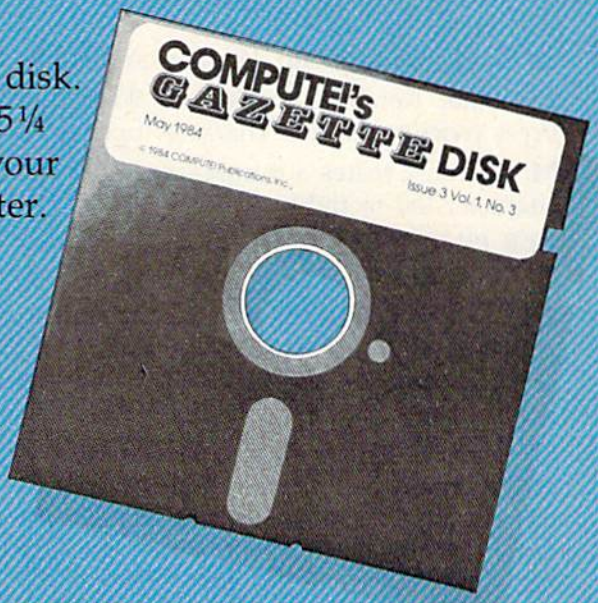

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the functions. It's really a lot of fun! The following keys control each function:

f1: Scroll character right. All pixels move right. The rightmost column of pixels wraps around to the left.

f2: Scroll character left. Wraparound is like f1.

f3: Scroll character down. All pixels move down. The last row of pixels wraps around to the top.

f4: Scroll character up. Wraparound is like f3.

R: Rotate. Rotates the character 90 degrees. Press twice to flip the character upside-down.

M: Mirror. Creates a mirror image of the character left to right.

CLR (SHIFT-CLR/HOME): Erases the current character.

CTRL-R or **CTRL-9:** Reverses the character. All set dots are clear, and all empty dots are set. The bottom half of the character set is the reversed image of the top half.

CTRL-back arrow: This causes the lower half of the character set to be the inverse of the upper half. This way, you only have to redraw the normal characters, then use CTRL-back arrow to create the inverse set.

F: Fix. Use this if you want to restore the normal pattern for the character. If you've redefined A, and press F while the blue cursor is on the character, the Commodore pattern for A will be copied back from ROM.

T: Type. This lets you try out your character set. The screen clears, with a copy of the character set provided for reference. You can type and move the cursor around, just as in BASIC. This is handy for envisioning sample screens, and fitting together multiple-character shapes. Press the RUN/STOP key to exit from Type and return to Ultrafont +.

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Saving And Loading Character Sets

To save your creation to tape or disk, press S. Then press either T for tape or D for disk. When requested, enter the filename, up to 16 characters. Don't use the 0: prefix if you're using a disk drive (it's added for you). The screen will clear, display the appropriate messages, and then return to the editing screen if there are no errors. If there are errors, such as the disk being full, Ultrafont + will read the disk error message and display it at the bottom of the screen.

Press a key after you've read the message and try to correct the cause of the error before you save again. The computer cannot detect an error during a tape SAVE.

To load a character set previously saved, press L and answer the TAPE OR DISK message. Enter the filename. If you're using tape, be sure the tape is rewound and ready. After the load, you will be returned to the editing screen, and a glance is all it takes to see that the set is loaded. If an error is detected on tape load, you will see the message ERROR ON SAVE/LOAD. Once again, if you are using disk, the error message will be displayed. Press a key to return to editing so you can try again.

Copying And Moving Characters

You can copy one character to another with function keys 7 and 8. When you press f7, the current character will flash briefly, and it will be copied into a little buffer. Ultrafont + will remember that character pattern. You can then position the cursor where you want to copy the character and press f8. The memorized character will then replace the character the cursor is resting on. You can also use the buffer as a fail-safe device. Before you begin to edit a character you've already worked on, press f7 to store it safely away. That way, if you accidentally wipe it out or otherwise garble the character, you can press f8 to bring back your earlier character.

Creating DATA Statements

A very useful command, CTRL-D, allows you to create DATA statements for whatever characters you've defined. Ultrafont + doesn't make DATA statements for all the characters, just the ones you've changed. After you press CTRL-D, Ultrafont + adds the DATA statements to the end of whatever program you have in BASIC memory. If there is no program, the DATA statements exist alone.

You can LOAD Ultrafont +, enter NEW to reset some BASIC pointers, LOAD a program you are working on, then SYS 49152 to Ultrafont + to add DATA to the end of the program. The DATA

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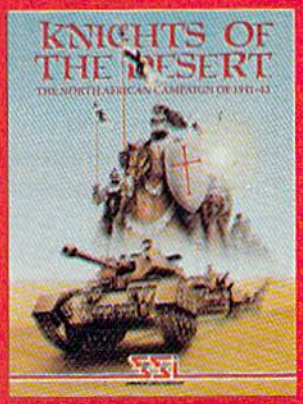

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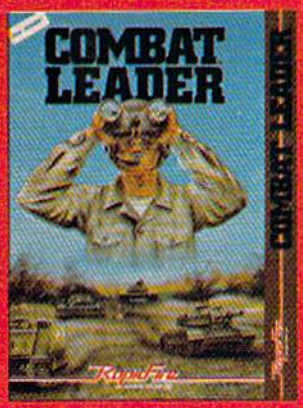

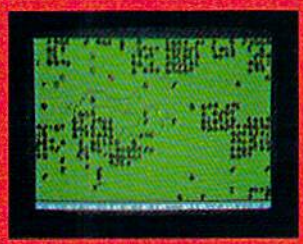

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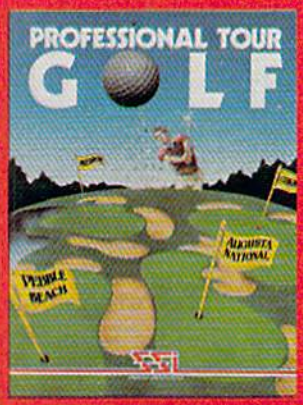

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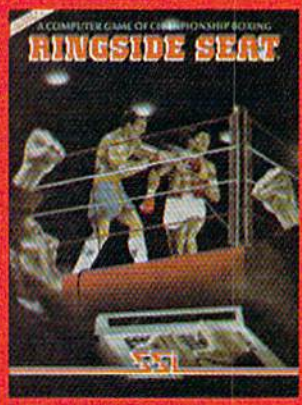

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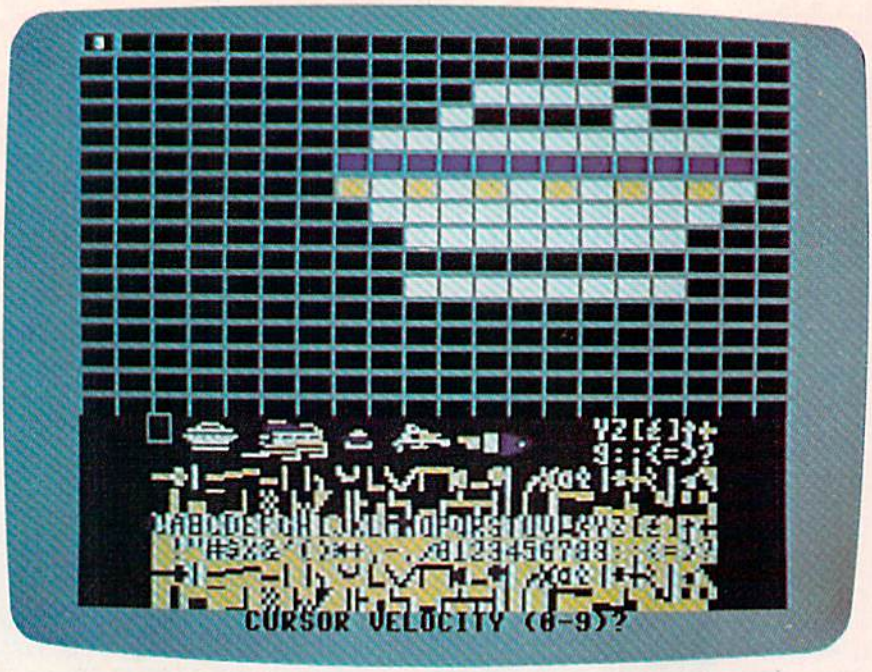

Creating multicolor characters for use in a game.

statements always start at line 60000, so you may want to renumber them. If you press CTRL-D twice, another set of DATA statements will be appended, also numbered from line numbers 60000 and up. Since the keys repeat if held down, just tap CTRL-D. If you hold it down, you may find a hundred DATA statements have been created! See the notes at the end of this article for more details on using the DATA statements in your own programs.

Exiting Ultrafont +

After you create the DATA, you'll still be in Ultrafont +. If you want to exit to see the DATA statements or go on to other things, press CTRL-X. The screen will reset to the normal colors and you'll see READY. If you've made DATA, a LIST will dramatically reveal it. I recommend you enter the command CLR to make sure BASIC is initialized properly after creating DATA statements. One thing to watch out for: Don't use RUN/STOP–RESTORE to exit Ultrafont +. The program moves screen memory from the default area at 1024, and the RUN/STOP–RESTORE combination does not reset the operating system pointers to screen memory. If you do press it, you will not be able to see what you are typing. To fix it, type blind POKE 648,4 or SYS 49152 to reenter Ultrafont + so you can exit properly.

Re-entering Ultrafont +

To restart Ultrafont + within the program, press SHIFT–RUN/STOP. After you've exited to BASIC, you can rerun Ultrafont + with SYS 49152. You'll see the character set you were working on previously, along with the message USE ROM SET? (Y/N). Usually, Ultrafont + will copy the ROM character patterns into RAM where you can change them. If you press N, however, the set you were working on previously is left untouched. Press any other key, like RETURN, to reset the characters to the ROM standard. You can copy either the uppercase/graphics set from ROM, or the lowercase set.

A Whole New World Of Multicolor

We're not finished yet. There is a yet another mode of operation within Ultrafont +, the multicolor mode. In multicolor mode, any character can contain up to four colors (one has to be used for the background) simultaneously. Multicolor changes the way the computer interprets character patterns. Instead of a 1 bit representing a solid pixel and 0 representing a blank, the eight bits are organized as four pairs of bits. Each pair can represent four possibilities: 00,01,10, and 11. Each of these is also a number in decimal from 0-3. Each two-bit pattern represents one of the four colors. Programming and using multicolor characters is described in "Advanced Use of Character Graphics," found in *COMPUTE!'s First Book of 64 Sound and Graphics.*

Ultrafont + makes multicolor easy. You don't have to keep track of bit pairs any more than you have to convert binary to decimal. Just press f5 and—presto! The whole screen changes. The normal characters are rather unrecognizable, and the drawing cursor is twice as wide (since eight bits have been reduced to four pixel-pairs, making each dot twice as wide). You only have four dots horizontally per character, but you can easily combine many characters to form larger shapes.

Multicolor redefines the way the joystick and fire button work. The fire button always lays down a colored rectangle in the color you are currently working with. The color it lays down is shown in the center of the drawing cursor. Press

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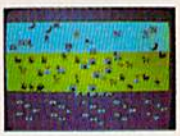

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the number keys 1,2,3, or 4 to choose different colors to draw with. The number of the key is one more than the bit pattern, so color 1 is bit pattern 00, and color 4 is bit pattern 11. When you first SYS to Ultrafont +, the four colors show up distinctly on a color TV or monitor.

You can easily change the colors. Just hold down SHIFT and press the appropriate number key to change that number's color. You will see the message PRESS COLOR KEY. Now press one of the color keys from CTRL-1 to CTRL-8 or Commodore-1 to Commodore-8. Hold down CTRL or the Commodore logo key as you do this. Instantly, that color, and everything previously drawn in that color, is changed.

Three of the colors (including 1, the background color) can be any of the 16 colors. But because of the way multicolor works, color 4 (represented by bit pattern 11, or 3 in decimal) can only be one of the 8 CTRL-colors. Assigning it one of the Commodore logo colors just picks the color shown on the face of the color key. Incidentally, it is the color of bit pattern 3 (color 4) that changes according to the character color as set in color memory. The other colors are programmed in multicolor registers 1 and 2 (POKE 53282 and 53283), so all characters share these two colors. When you want to vary a certain color without affecting the rest of the characters, you'll want to draw it in color 4.

Some of the commands in the multicolor mode aren't as useful as others. You have to press f1 and f2 twice to shift a character, since they only shift one bit, which causes all the colors to change. You can use CTRL-R, Reverse, to reverse all the colors (color 1 becomes color 4, color 2 becomes color 3, and color 3 becomes color 2). R: Rotate changes all the colors and is rather useless unless you press it twice to just turn the character upside down. M: Mirror will switch colors 2 and 3, since bit pattern 01 (color 2) becomes 10 (color 3). You can still copy characters using f7 and f8 (see above).

Returning To Normal

You can switch back instantly to the normal character mode by pressing f6. If you were drawing in multicolor, you can see the bit patterns that make up each color. Multicolor characters look just as strange in normal mode as normal characters look in multicolor.

If you changed colors in the multicolor mode, some of the colors in the normal mode may have changed. You can change these colors as in multicolor mode. Press SHIFT-1 to change the color of the empty pixels, and SHIFT-3 to change the color of the eight rows of characters. Use SHIFT-2 to change the color of the on pixels.

Quick Reference: Ultrafont + Commands

Cursor keys:	Move to next character
HOME (CLR/HOME):	Moves the cursor to upper left corner Press twice to go back to start
V:	Cursor velocity; answer from 0 (slow) to 9 (fast)
f1:	Scroll right with wraparound
f2(SHIFT-f1):	Scroll left
f3:	Scroll down
f4(SHIFT-f3):	Scroll up
R:	Rotate 90 degrees; press twice to invert
M:	Mirror image
SHIFT CLR/HOME:	Erase current character
CTRL-R,CTRL-9:	Reverse pixels
CTRL←, CTRL-F:	Copy first four rows of characters, inverted, to bottom four
F:	Fix character from ROM pattern
L:	Load. Tape or Disk, Filename
S:	Save. Tape or Disk, Filename
T:	Typing mode; RUN/STOP to exit
f7:	Memorize character (keep)
f8(SHIFT-f7):	Recall character (put)
f5:	Switch to multicolor character mode
f6(SHIFT-f5):	Return to normal character mode
CTRL-D:	Make DATA statements
SHIFT-RUN/STOP:	Restart Ultrafont +
CTRL-X:	Exit Ultrafont + to BASIC

Programming

You'll find the article, "Advanced Use of Character Graphics," found in *COMPUTE!'s First Book of 64 Sound and Graphics* quite informative. It shows you how you can make the most of characters. The article includes several short machine language utilities that you can use when writing games or other programs using these custom

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characters. It shows how your program can read the SAVEd files directly, without having to POKE from DATA statements. You should still have a good grasp of the essentials of programming characters (see Scott Card's "Make Your Own Characters," also in *COMPUTE!'s First Book of 64 Sound and Graphics*). Ultrafont + is intended as an artistic aid in your creations, letting the computer take over the tedious tasks it is best suited for.

Notes: How To Use The DATA Statements

The DATA statements are created from lines 60000 and up, as many as necessary. Each line of data has nine numbers. The first number is the internal code of the character (the code you use when POKEing to the screen). It represents an offset into the table of character patterns. The eight bytes that follow are the decimal numbers for the eight bytes it takes to define any character. A sample program to read them and display them could be:

```
10 POKE 56,48:CLR
50 READ A:IF A=-1 THEN 70
60 FOR I=0 TO 7:READ B:POKE 12288+A*8+I,B
   :NEXT:GOTO 50
70 PRINT CHR$(147);"{10 DOWN}":REM TEN CU
   RSOR DOWNS
80 FORI=0TO7:FORJ=0TO31:POKE1028+J+I*40,I
   *32+J:POKE55300+J+I*40,1:NEXT:NEXT
90 POKE53272,(PEEK(53272)AND240)OR12:END
```

You'll also need to add the following line to the end of your DATA statements:

```
63999 DATA -1
```

If you want to have your cake and eat it, too (that is, also have the normal ROM patterns), copy them from ROM down to RAM by adding:

```
20 POKE 56334,PEEK(56334)AND254:POKE 1,PE
   EK(1)AND 251
30 FOR I=0 TO 2047:POKE 12288+I,PEEK(5324
   8+I):NEXT
40 POKE 1,PEEK(1)OR4:POKE 56334,PEEK(5633
   4)OR1
```

See program listing on page 138.

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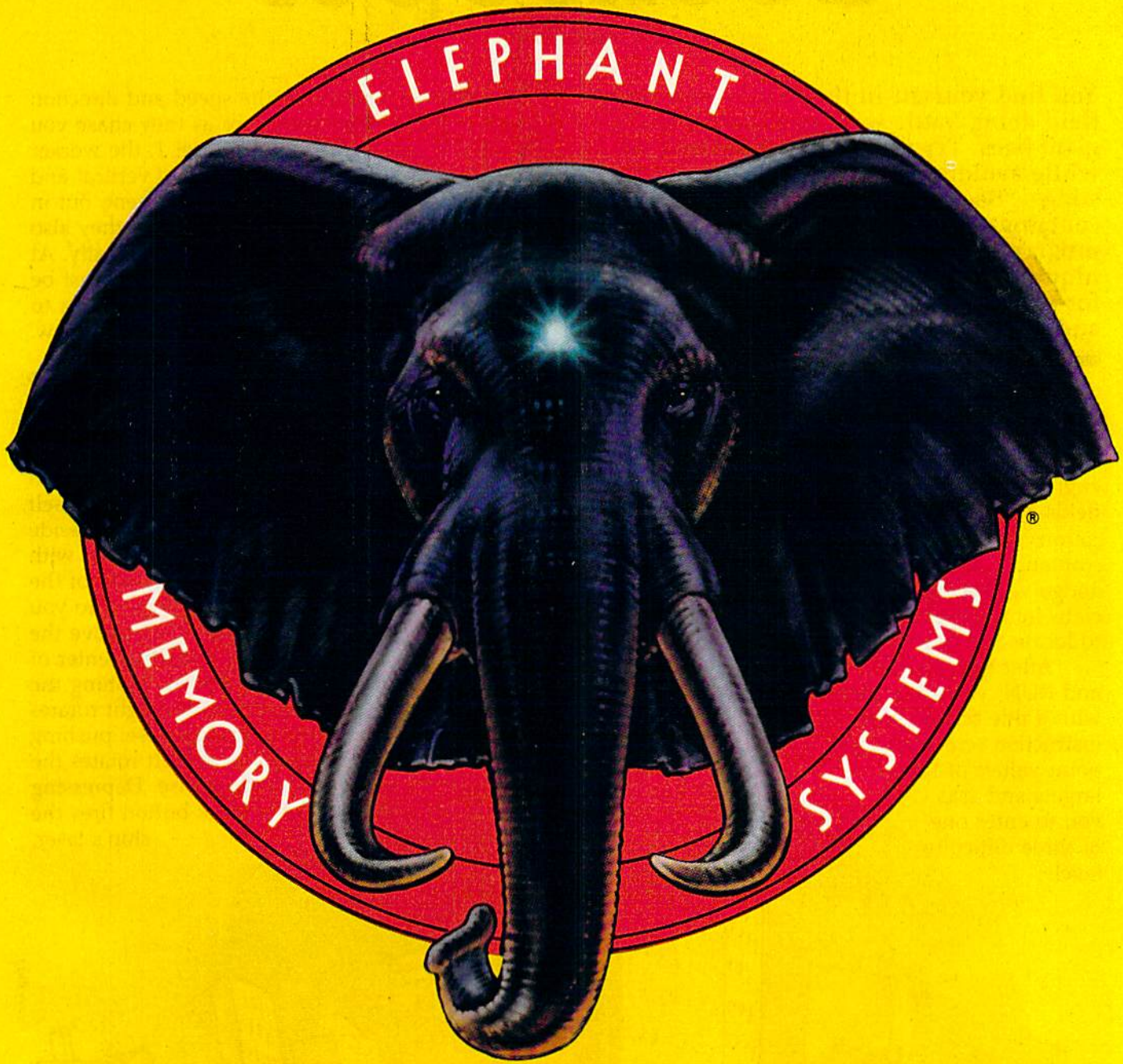

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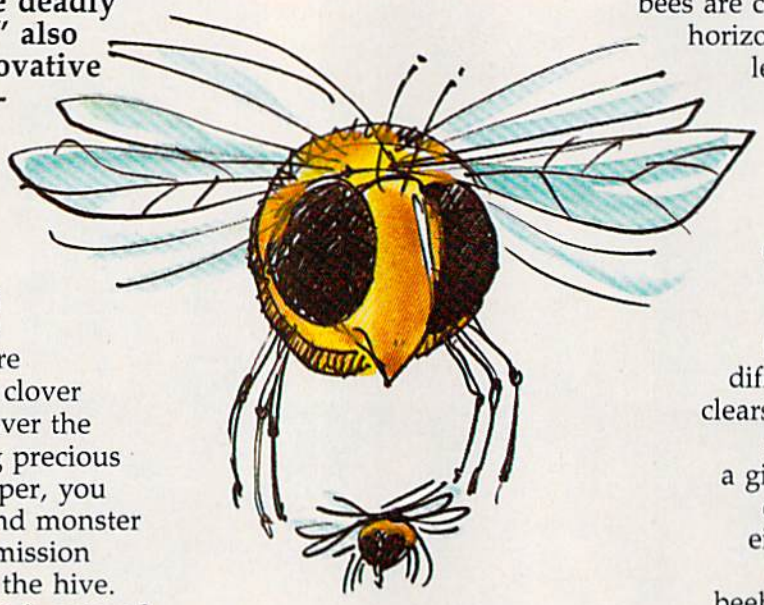
Beekeeper

Daniel Gray

You find yourself in the middle of a clover field doing battle with some rather nasty giant bees. Try maneuvering to the hive while avoiding the deadly stings. "Beekeeper" also contains some innovative programming techniques. Versions for the VIC-20 and the 64.



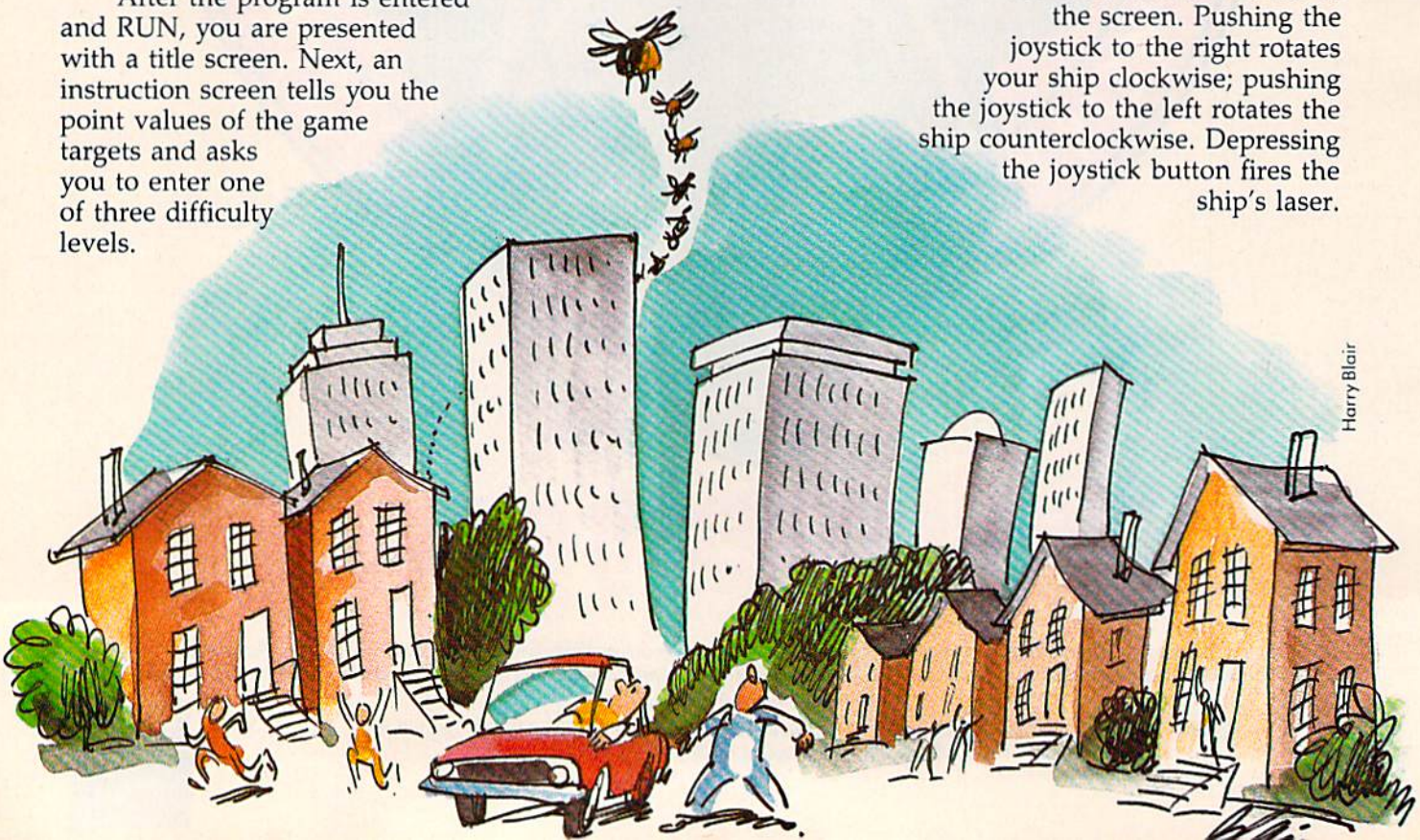
Giant bees are taking over the world. Their enormous beehives are engulfing cities; their clover fields are spreading over the countryside, invading precious croplands. As Beekeeper, you dodge worker bees and monster crabs in a desperate mission to locate and destroy the hive.

After the program is entered and RUN, you are presented with a title screen. Next, an instruction screen tells you the point values of the game targets and asks you to enter one of three difficulty levels.

Each level determines the speed and direction of the worker bees and crabs as they chase you around the clover field. In level 1, the worker bees are confined to vertical and horizontal movement, but in levels 2 and 3 they also move diagonally. At level 3, you must be very quick in order to avoid sting and claw.

The Bees Hunt You Down

Once you've selected a difficulty level, the screen clears and you find yourself in a clover field beside a giant beehive filled with drones. The first of the eight ships given to you appears just above the beehive, near the center of the screen. Pushing the joystick to the right rotates your ship clockwise; pushing the joystick to the left rotates the ship counterclockwise. Depressing the joystick button fires the ship's laser.



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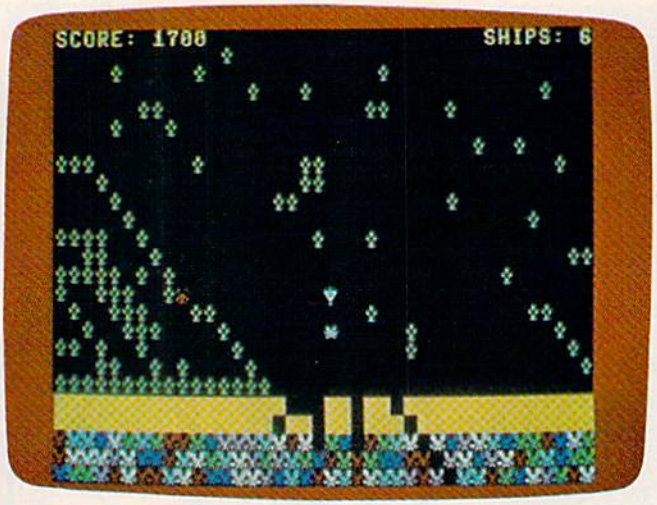
While the Beekeeper uses the laser on the hive, a huge worker bee gets ready to attack (VIC version).



A monster crab, leaving trails of clover, homes in on the Beekeeper (64 version).

Use The Laser To Score

If you don't control the ship, it will run into the clover or the hive. If you are stung or pinched, your ship is destroyed. Defend yourself with your laser; each worker bee or crab you disable is worth 200 points.

Each block of the hive is worth 50 points and each drone is worth 100 points. You can also fire at clover to get it out of your way (no score). The best way to aim at the hive is by looping around the clover field until you are moving directly toward the target. Continue straight ahead while firing at the hive.

Once all 66 drones in the hive have been exterminated, the screen clears and another field is created, along with more ships. The game is over when all your ships have been destroyed.

Super Expander Version

If you have a Super Expander, you should substitute the lines below for the corresponding lines in Program 1:

```
50 S=RJOY(0)                                :rem 186
60 REM NOT NEEDED                           :rem 224
70 IFS<128THEN130                           :rem 227
130 IFS<>4THENIFS<>8THENIFS<>132THENIFS<>
    136THEN200                              :rem 238
140 CC=1:IFS=4ORS=132THENCC=-1               :rem 45
```

These lines replace POKEs and PEEKs with the Super Expander's RJOY(0) function. Since the function is in machine language, the joystick response is slightly improved.

Also, the Super Expander version requires less memory than the original because several variables are eliminated.

A VIC-20 Keyboard Version

To use the keyboard instead of the joystick, substitute these lines for the corresponding lines in Program 1:

```
50 S=PEEK(203)                              :rem 0
60 REM NOT NEEDED                           :rem 224
70 IFS<>42THEN130                           :rem 236
130 IFS<>52THENIFS<>13THEN200                :rem 7
140 CC=1:IFS=52THENCC=-1                    :rem 153
600 POKE36879,31:PRINT"{CLR}{RED}{DOWN}
    {RIGHT}USE KEYBOARD TO PLAY":PRINT"
    {BLU}{DOWN}{RIGHT}BEE"TAB(11)")"SPC(5
    )"100"                                  :rem 193
```

The keyboard version plays exactly like the joystick version, except that the O, P, and F keys replace the joystick controls. The P key rotates the ship clockwise, the O key rotates it counterclockwise, and the F key is the fire button.

These keys are detected by PEEKing memory location 203 (for the VIC or 64). Each time a key is pressed, a unique number representing that key is stored in location 203 (and in location 197). For example, when F is pressed on the VIC, a 42 is stored in that address. When O is pressed, location 203 will contain a 52, and a 13 is placed in this location when you press the P key. (For the 64, pressing F, O, and P will cause 21, 38, and 41, respectively, to be stored in location 203.)

To change the 64 version (Program 2) from joystick to keyboard control, substitute these lines:

```
50 S=PEEK(203)                              :rem 0
60 REM NOT NEEDED                           :rem 224
70 IFS<>21THEN130                           :rem 233
130 IFS<>38THENIFS<>41THEN200                :rem 12
140 CC=1:IFS=38THENCC=-1                    :rem 157
600 PRINT"{CLR}"SPC(10)"{RED}{DOWN}USE KE
    YBOARD TO PLAY"                         :rem 26
```

Since this process requires fewer variables than the joystick routine, not as much RAM is used. However, the ship is slightly harder to control with the keyboard.

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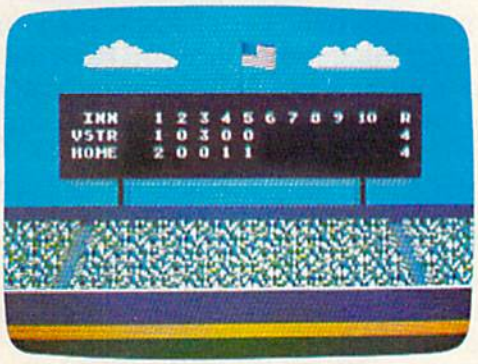

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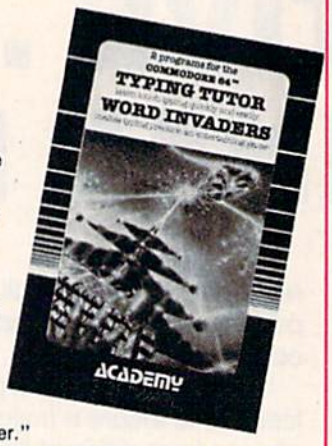

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If you want to change the keys which control your ship's movement and laser fire, you will need to know the number which represents your new key in location 203. To find the number, type in this one-line program:

```
10 PRINT PEEK(203): GOTO 10
```

This simple program is an infinite loop that displays the contents of location 203 onto the screen. When you RUN the program, you will see the number 64 scroll continuously up the screen; location 203 contains a 64 when no key is being pressed. To see the number representing any key, just hold down the key and note the number that scrolls up the screen. Once you have the number of your new key, you can make that key your new fire button by substituting the number in place of the 42 in line 70 of Program 1 for VIC. (For the 64, replace the 21 in line 70 of Program 2.)

A Chart Of Keyboard Codes

You can use this one-line program to make a chart of the numbers representing each key on your keyboard. Hold down each in turn and note the number on the screen. Pressing the following keys does not affect location 203: RESTORE, SHIFT, SHIFT LOCK, CTRL, the Commodore key, and RUN/STOP. Use RUN/STOP to break out of the infinite loop.

Other versions of Beekeeper can be created by manipulating the initial values of the variables. Here is a list of the most useful variables in lines 700–710:

Variable	Description
P1	Starting position of ship on screen
SH	Starting direction of ships
SQ	Starting number of ships provided in each level
AQ	Starting number of drone bees in hive for each level
SA	Highest point on the screen that the ship can reach
SE	Lowest point on the screen that the ship can reach

Also, the IF-THEN statement in line 110 can be changed to give your ship's laser a greater range. For example, you can have the laser reach across the VIC screen by changing this statement to:

```
IF I<21 THEN 90
```

For the 64 version, substitute the number 39 for 21 in the above statement.

The DATA in lines 840–880 (lines 840–885 for the 64) controls the shape of Beekeeper's user-defined characters. By changing the DATA in these lines, you can create your own characters.

If you prefer not to type in this program, send $3, a cassette, a note giving the Beekeeper variation you want (VIC version only), and an SASE to:

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See program listings on page 136.

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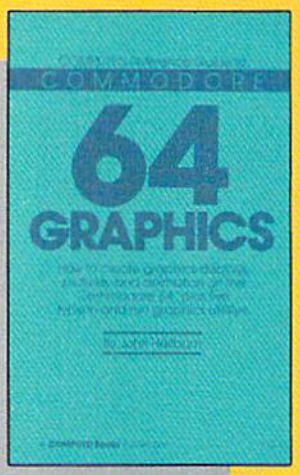

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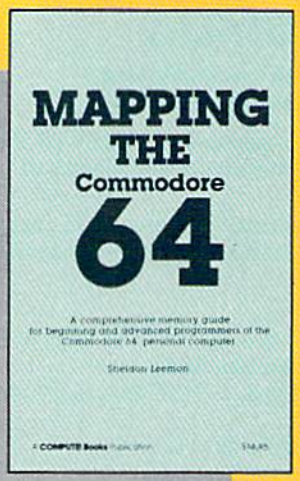

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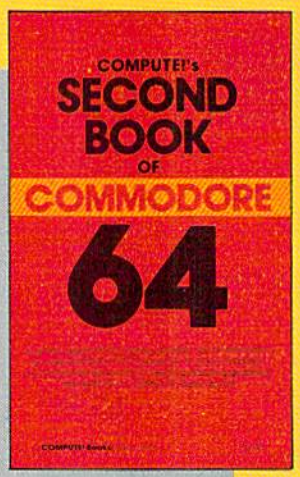

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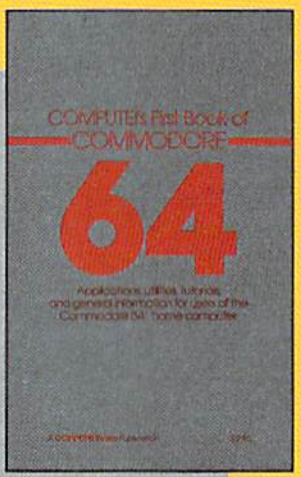

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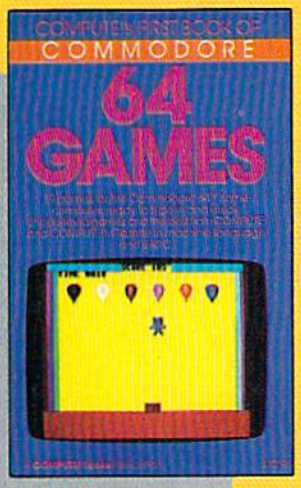

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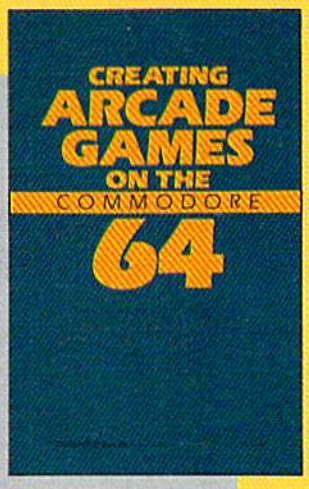

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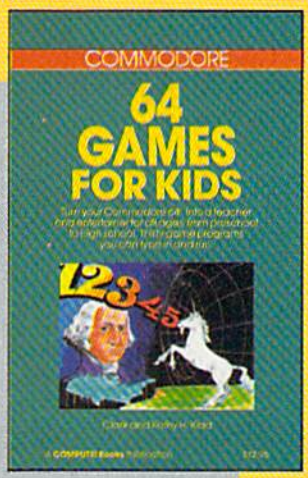

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Bonking Barrels

Bruce S. Gordon

Score points by climbing the girders, but beware the falling barrels. For the VIC and 64.

The goal of this game is to weave your way through a maze of girders and make it safely to the top. But someone (you can't see who) is rolling large barrels in your direction.

"Bonking Barrels" will appeal to those who want to take a break from fast-action games which require quick reactions. There are plenty of safe spots where you can stop and watch the action while you decide on your next move. Some people prefer to play with calculating conservatism, moving slowly from level to level, while others rush upward with wild abandon. The choice is yours.

Keyboard Control

Start at the bottom of the screen with the first of four players. Use the A key to move left, D to move right. When you are underneath a break in the girders, the f3 key allows you to jump up to the next level. You can create an opening at any time with the f1 key, although doing so will decrease your score. If you reach the top, you start at the bottom of a new screen.

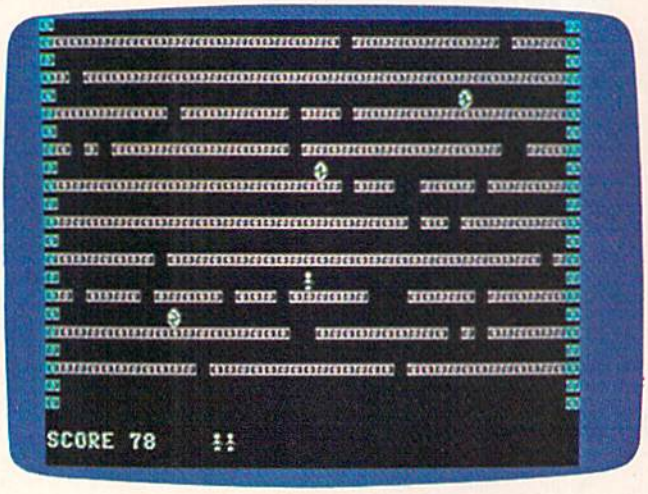
You get two points for each level you climb. Each time f1 is used to blast an opening, you lose five points. Getting bonked costs you eight points. The new score is displayed when you reach the top or when a barrel reaches the bottom of the screen, whichever comes first.

After the first two screens, the number of barrels is randomly selected, which affects the speed of play. In addition, each time a new screen appears, the passageways between levels are placed randomly. Sometimes you will find a level with no openings, and will have to use the blaster. It is also useful for escaping from a tight squeeze.

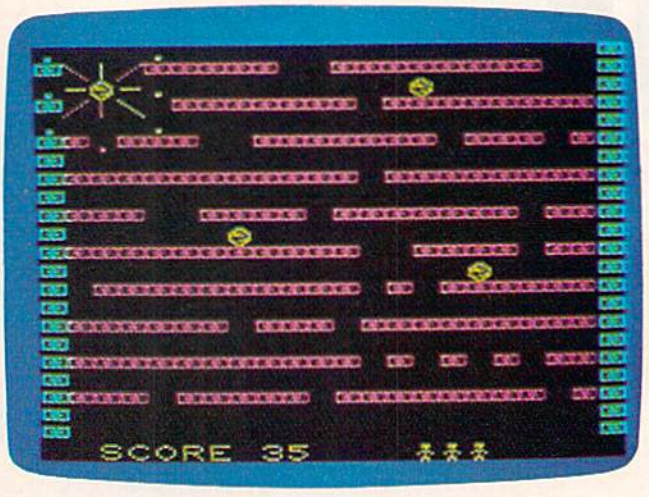
VIC Instructions

When entering the VIC version, you can save memory by leaving out the REM statements. Or delete lines 92–100 (the instructions) and change line 91 to RETURN. The program fits very snugly into an unexpanded VIC.

See program listings on page 142.



The player rests for a moment in a safe area (64 version).



A barrel has bonked the hero in the VIC version.

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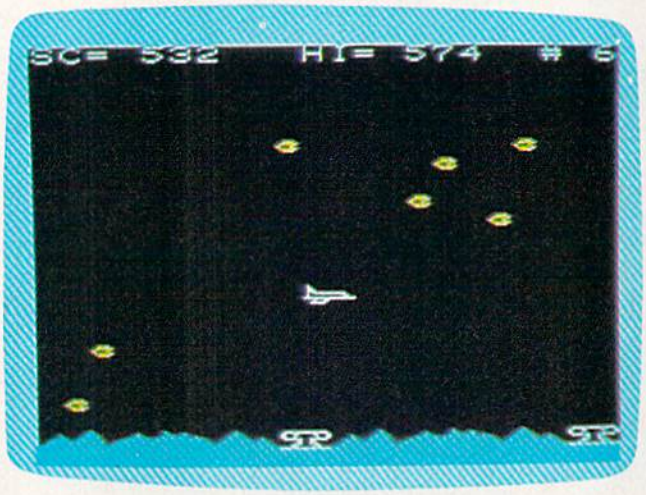
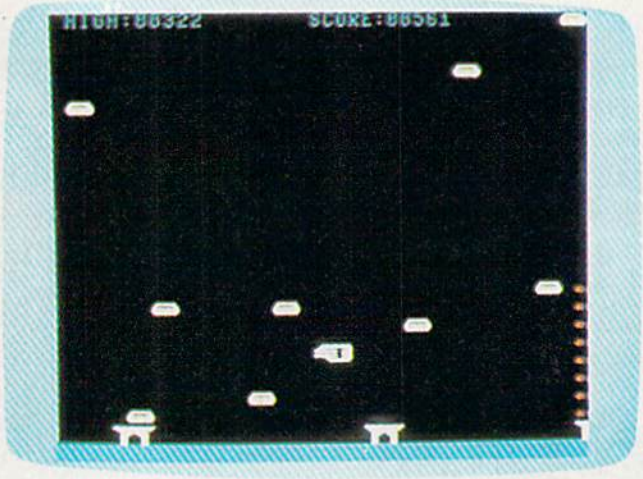
SPACE PATROL

Salvador Alcántara



In this VIC version, the player must decide to quickly descend and destroy the two ships about to land or move up and attack the new wave of invaders.



The player's ammunition (on the right edge) is running low as the invaders begin to land (64 version).

You are engaged in a battle in space above your planet, trying to prevent the aliens from landing. If you're to succeed, a good strategy is required. Versions are included for the VIC and 64. Joystick required.

Your mission is to defend your planet from an intergalactic invasion. You are in charge of a space patrol craft which can move up and down the center of the screen. Moving the joystick to the left or right changes the direction the ship is facing. If you hold the joystick in the same position, the surface starts moving in the opposite direction, giving the appearance of motion.

Invader ships appear at the top of the screen and move down at variable speeds; this makes their capture more exciting. The fire button shoots torpedoes in the direction your ship is pointing. Use the torpedoes to destroy invader ships and increase your score. Remember that your ship moves vertically, but you can shoot only horizontally.

Don't Let Them Land

You want to prevent the invaders from landing on your territory. When five alien ships reach the surface, you have failed and the game is over. But you get an extra chance with each 500 points scored in the VIC version. In the 64 version, you get an extra chance with the first 500 points, and an extra chance with each 300 points scored thereafter. The number of remaining chances is indicated in the upper-right corner of the screen and the score is indicated in the upper-left corner. The 64 version also contains a pause feature (f1).

Your score depends on the skill level selected. You earn more points for hitting ships at harder levels. The skill level varies according to the speed and number of invader ships; you get

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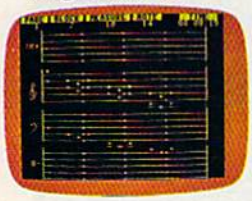

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higher speeds and fewer ships as the level is increased.

The game is not as easy as it seems. In the beginning, you are provided with only 20 torpedoes. Each time you fire you lose one. A column of bombs along the right side of the screen tells you the number of torpedoes remaining. When you shoot all your torpedoes, your ship looks different on the screen (it seems to be empty) and you cannot fire at the invaders.

Find A Supply Base

To obtain a new provision of torpedoes, you must land in one of the supply bases that appear at the bottom of the screen. To reach the supply base, you have to be exactly over the base and move the joystick down. You can't get a new provision of torpedoes until you have finished your current supply.

The new provision is less than the original, depending on the level selected. Each time you visit the bases you receive fewer torpedoes. Five is the minimum you can get.

One of the special features in this game is the moving characters. During program execution the definition of the invader ship in memory is altered. This makes all the ships in the screen change simultaneously, giving them a uniform motion.

Another exciting aspect of the game is the way that the planet surface moves, offering a changing background for the game.

Loading Instructions

"Space Patrol" for the VIC is divided into two parts. Program 1 loads the data for the custom characters into a block of protected memory. This prevents the data from being destroyed when the main program is loaded. After Program 1 is run, it automatically loads and runs the second program. Program 2 is the game itself. For disk you must save Program 2 with the filename "SP". If you are saving to tape you must change ,8 to ,1 in Line 45 of Program 1.

Tape users should type in and save Program 1, then type in Program 2 and save it immediately following Program 1 on the same tape. Again, use "SP" as the filename.

The 64 version of Space Patrol (Program 3) plays the same (except for bonus points, as mentioned earlier) as the VIC version.

I hope you find that these techniques will help you in the design of new and more exciting games. If you reach a bonus score, wait for a great surprise.

See program listings on page 145.

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As a sole survivor of **Falcon Patrol** you must try and stop the attacking jets from destroying your oil installations and refuelling bases. You **VTOL** (Vertical Take-Off and Landing) **jet** is armed with **100 anti-aircraft missiles** (AAM's) and a very sophisticated **radar**. This **radar** shows your refuelling and re-arming bases and any **enemy aircraft** (their direction and altitude). As this is not only a tremendous **arcade-style** game with **very fast** action, but incorporating **strategy**, you must pit your wits against the **enemy**.

Comments

● "This game is one of the best I've seen for the 64 so far." Popular Computing Weekly.

● "With excellent graphics, original sound effects and a very high addiction factor, this one is a must for any 64 owner. I award this game full marks." Personal Computer Games.

● "A fast action and compelling game which I highly recommend." Personal Computer News.

HIDEOUS BILL And The Gi-Gants

A gripping three-part tale of heroism and romance. Can you help **Hideous Bill** pit his wits against the **Gi-Gants** to rescue his true love **Greta?**

1st Screen – You are in the first level of the Gi-Gants nest. Your task is to **save Greta** (your true love) from becoming ant food. To complete this phase you must crush all the eggs. Gi-Gant's shells are covered in a **poisonous slime.**

2nd Screen – On this level there are **no weapons** to help you.

3rd Screen – The object of your true love is now in sight! **Greta** can be seen imprisoned in the **Gi-Gant's tomb.**

Comments

● "This game has been very well designed. I enjoyed playing the game. All in all a well presented package." Home Computing Weekly.

● "It's very addictive and like Falcon Patrol the use of sound is superb." Which Micro.

SPACE AMBUSH

You will be attacked by strangely shaped **mutants** who will try to destroy your ship by either **ramming** or **bombing** it. To defend yourself you have a **fast-firing laser cannon.** At first your **attackers**, which appear totally at random, are slow moving and easy to hit. But when hit they split in two, and speed up. Hit them again and they are likely to drop a **proton bomb** on you. Successive mutant waves appear **time** after **time** and in increasing numbers.

After **24 waves** the re-docking procedure is followed and you then emerge with **twin lasers!** Now the action really speeds up and you will become one of the fastest beings ever to come into contact with a **Commodore 64.**

Comment

● "This is a truly addictive game of the old school, with excellent sound, color, game play – compulsive and heart-racing." Leisure Electronics Trader.

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REVIEWS

Gridrunner II For The VIC-20

Todd Heimarck, Assistant Editor

Read the instructions and you almost feel obligated to play:

"It is 100 years after the infamous Grid Wars. You, one of the few survivors of the Gridrunner Squadrons, are sitting watching TV when suddenly an announcement breaks in:

"'All pilots with gridrunner experience report to base immediately. This is an emergency!'

"Arriving at base, you are shown into a briefing room, already thronged with pilots. The briefing begins:

"'We have brought you here because once again Earth is in danger. The droids have returned—with superior weapons and tactics! We intend to form a new squadron—codename MATRIX—of the best pilots to combat this menace!'"

You have been recalled to duty. It would be unpatriotic to refuse. Humankind is depending on you.

The basic idea of Hesware's *Gridrunner II* (originally marketed as *Attack of the Mutant Camels*) is that aliens attack and you fight back. But this game is more than a typical shoot-'em-up arcade-style game.

Droids, bombs, zappers, and the snitch are some of the perils in Gridrunner II.

Traveling The Grid

If you are not familiar with the original *Gridrunner*, you need to understand that Earth depends on huge grids which orbit the planet and provide electricity. Aliens have landed on the grids. It is your duty to eliminate them using your gridrunner, a spaceship specially designed for travel on the grid.

Using a joystick, move your ship up and down, back and forth. Press the fire button to shoot your cannon. Your bullets travel straight up; you cannot shoot left, right, or down. Hitting an alien ship does not necessarily destroy it: It becomes a pod which eventually develops into a bomb that drops straight down. After you shoot an alien you have a chance to destroy the pod; it takes a few extra shots.

But once it starts dropping, your only option is to get out of the way because your cannon is ineffective against bombs. If you shoot a lot of droids in one section of the screen, expect a tumult of bombs within a few seconds. You soon learn to clear away some safe areas.

The enemy ships enter at the top of the grid, one leading the others, traveling in a long chain (as in *Centipede*). They traverse the screen in a boustrophedon manner. If you shoot a

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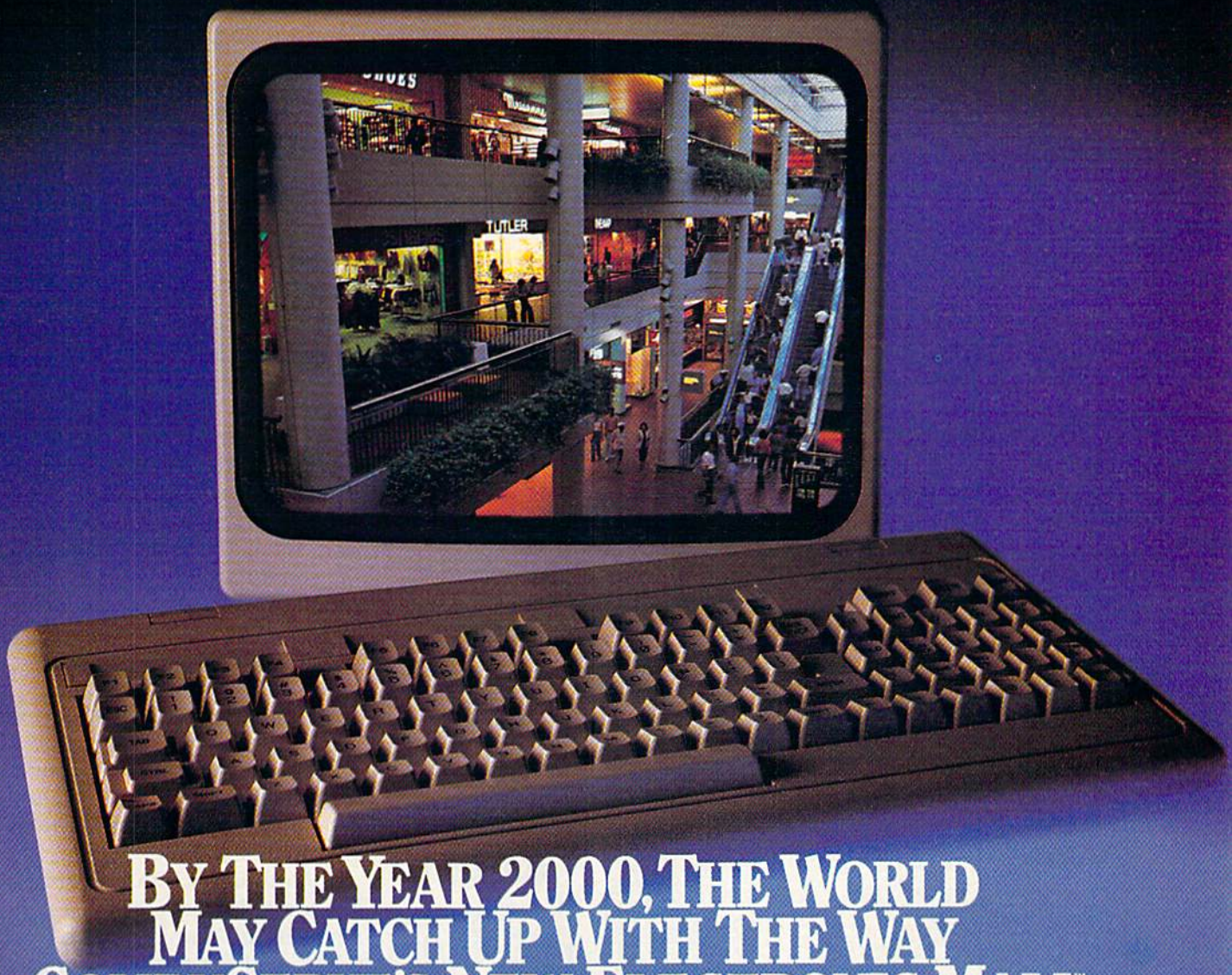

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ship in the middle of the chain, the squad splits into two smaller chains which move in different directions. When a droid ship hits one of the pods, it drops down a notch and reverses course. When it reaches the bottom, it stops moving back and forth and switches to diagonal mode.

The Dangerous Zappers

Battling droids and pods is a snap. To ambush a squad of droids, just let a few go by and, while moving in the same direction, start shooting. The bombs are easily evaded.

But there are complications. The alien invaders have more weapons in their arsenal.

The X-Zapper moves down the left side of the screen. The Y-Zapper travels from left to right along the bottom. Neither is actually on the grid; you can't attack them. The X-Zapper regularly sends out a short burst. At the same time, the Y-Zapper shoots a laser. Where the two meet, a baby pod is planted. The pod, of course, grows into a bomb.

The pods and the bombs are not the problem, though. The real dangers are the short burst from X and the laser of Y. They zap so fast you have no time to get out of the way.

Fortunately, the zappers follow a regular pattern; once you figure it out, you remember which grid locations pose a danger and when. Unfortunately, the zapper pattern makes it more difficult to ambush the droids. You can't just jump on them from behind, you have to worry about where the next zapper blast is coming from. And, worse yet, you cannot concentrate on the droid waves. Your eyes stray from the aliens to the X-Zapper on the left and the Y-Zapper at the bottom.

And there's more.

The Snitch

You have to watch for the turncoat humanoid. He has joined the alien side and helps them by running along the top of the grid. When the Snitch is directly above you, he stops. He waves his arms. If you stay where you are, the Y-Zapper sends an extra laser blast directly at you. Instead of staying where you feel

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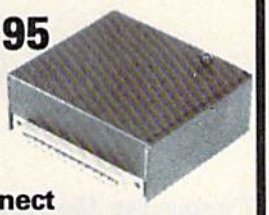
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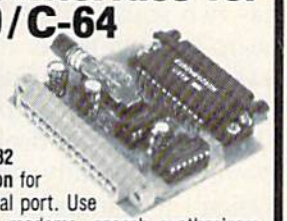
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comfortable, you have to move back and forth out of range of the traitor.

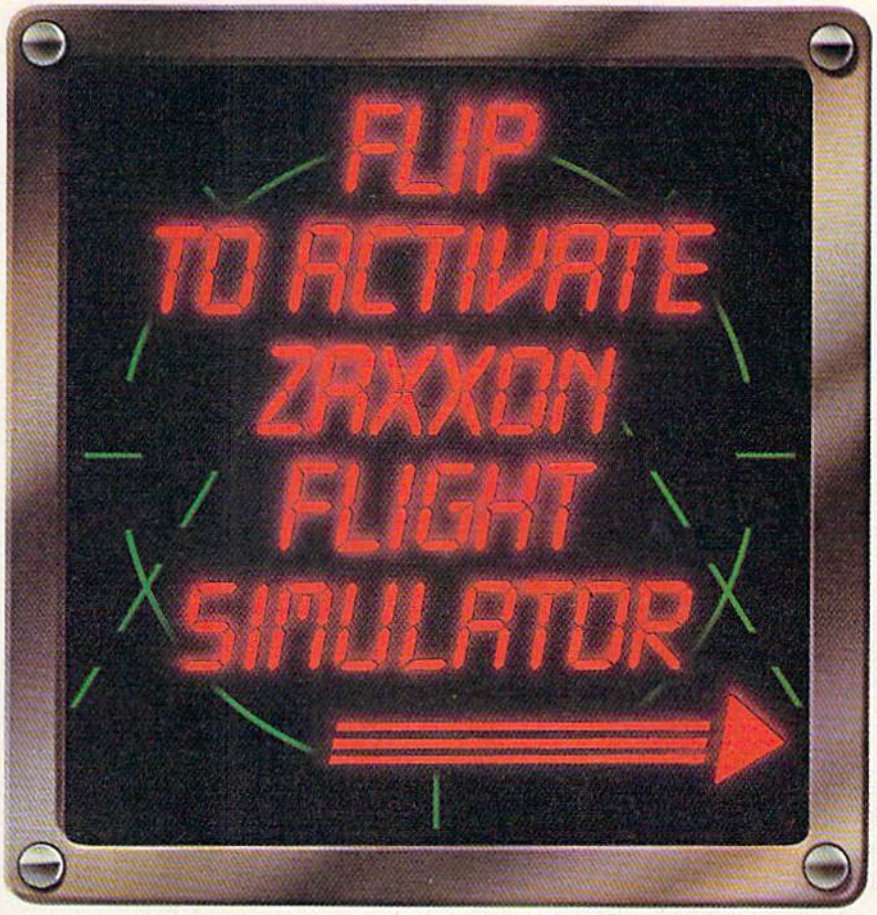
The actions of the Snitch are frustrating, like a little brother who eavesdrops and then reports everything to your parents. The Snitch, after all, is one of us. And we are laboring nobly, trying to save the Earth from total destruction. It hurts when you lose a gridrunner due to treachery.

Fighting against aliens is a standard game concept; you have to shoot them before they shoot you. And the Snitch could have been just another alien, a spotter or tracker or whatever. But knowing the Snitch is a human, a spy, makes it worse when you are zapped. You are angry at the betrayal and want to get him back to the side of truth and justice.

Psychological Warfare

Looking like recent arrivals from a pack of Camel cigarettes, the mutant dromedaries (perhaps from Andromeda?) meander down the screen individually (unlike the droids, who travel in organized squads).

The Mutant Camels are rumored to be psychological weap-



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ons, designed to confuse and disorient. And they do confuse. First, they're camels who live in outer space. Second, they clutter up the screen and speed up the pace of the game. And, finally, they don't seem to do anything. They don't attack you, they don't drop bombs, they just move down the screen. You can even run into them with your ship; they just bounce off.

You can't ignore them, however. In certain rounds they make the score run backwards. You lose more and more points the longer they stay on the screen.

(According to the game's designer, Jeff Minter, the camels are a tribute to San Francisco radio station KMEL, which broadcasts at 106 FM. And, not so coincidentally, shooting a camel is worth 106 points.)

In later rounds, another psychological weapon is introduced. Deflexors appear on the screen. They're like mirrors. Shoot one and your shot ricochets, often right back at you. The more complicated the game gets, the more careful you have to be.

Twenty Screens, Nine Ships, And Mystery Points

Gridrunner II has 20 different screens, although I've only seen 14 of them. As you would expect, clearing a screen advances you to the next one.

You start with five gridrunner ships. Each time you clear a screen, you are awarded another ship, up to a maximum of nine. With strategic play, a game can last 20 or 30 minutes.

Once in a while, after you clear the screen, you are awarded a mystery bonus. There are certain patterns which tend to lead to a bonus, not moving your ship on the first screen, for example.

The game begins at a simple level, a single squad of droids descending slowly. Level two has two squads. The Snitch appears in level three. In later levels, the Mutant Camels and Deflexors come into play. At the highest levels the droids start out moving diagonally, which is difficult to handle at first.

Gridrunner II uses the VIC's features to maximum advantage. The graphics are superb, the sound effects are very good, and it is challenging. As a basic shoot-'em-up game, it is one of the best.

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Flexidraw For The Commodore 64

Daniel Feldman

Visual impact is what you get with the new *Flexidraw* system, a light pen driven, machine language hardware/software package for the Commodore 64. This professional quality, high-resolution (320 by 200 pixel) offering enables you to easily create either freehand or technical drawings on your screen.

Using all 16 colors of the 64, *Flexidraw* features an on-screen dynamic menu with audible feedback. Menu items are selected with the light pen, and your creations can be saved or recalled using a 1541 disk drive.

You can also print out any images on various printers: the Commodore 1525 (or equivalent); the Gemini 10, 10x, and 15 (or equivalent); the Epson MX/FX-80/70; the C. Itoh Prowriter; and the Okidata Microline 82/92/93. *Flexidraw* also supports various interfaces, such as the VicTree, Cardco B, G, and G+, and the Microworld MW 302.

Sleeping Genie

Flexidraw awakens the sleeping genie of hi-res graphics. The genie, otherwise known as the VIC-II chip, controls 64,000 specks of light on the C-64 video display. *Flexidraw* stimulates the VIC-II to do far more than make the usual Commodore characters and sprites.

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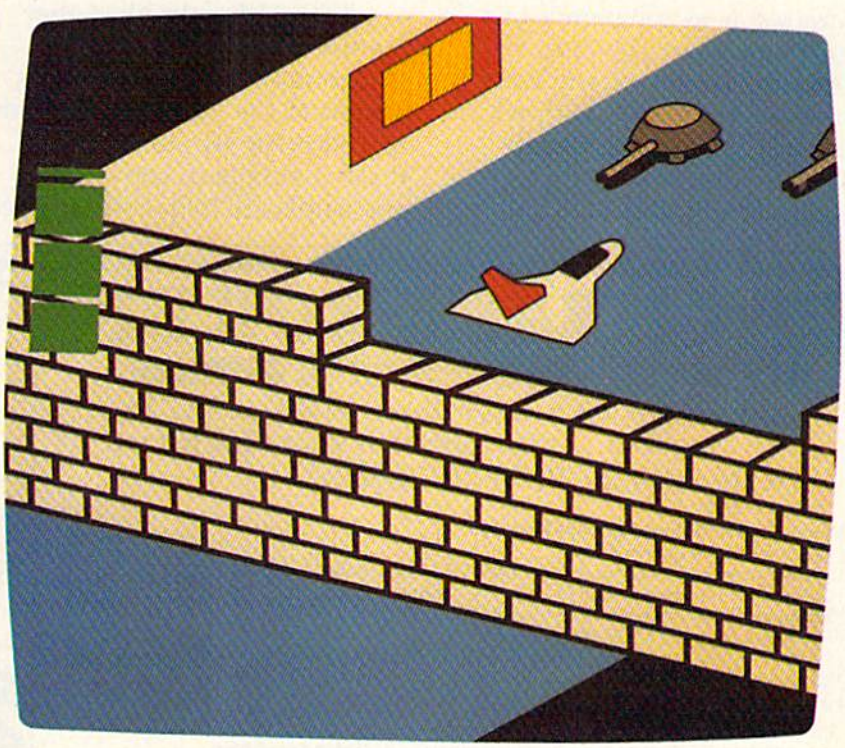

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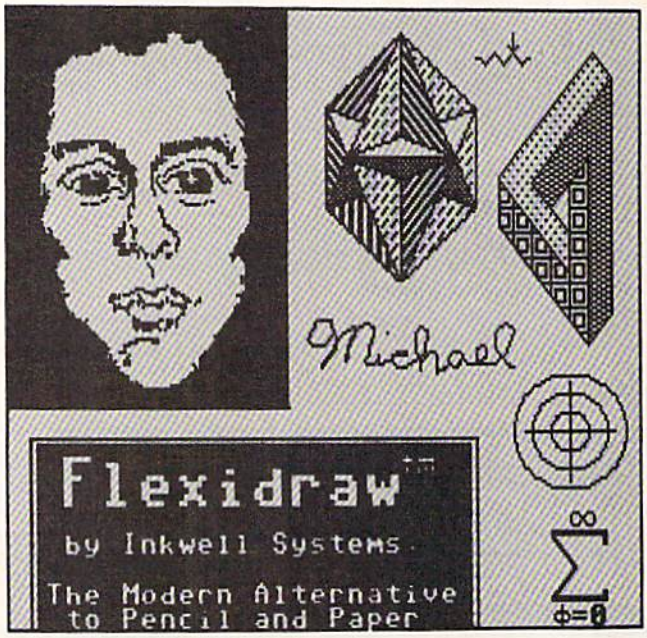

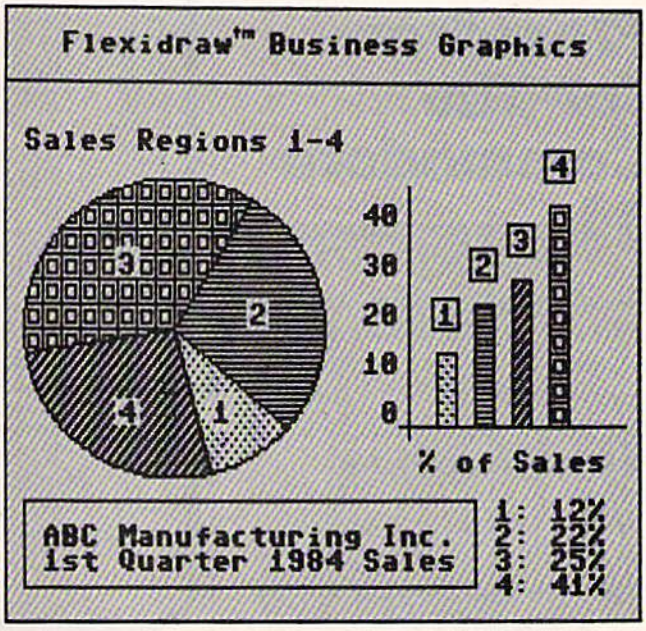

The easiest way to describe *Flexidraw* is to compare it to a word processor. The most appealing feature of any word processor is the ease with which it permits you to manipulate text. Extend these same powers to images and you have an electronic image processor.

I immediately liked the feature which permits me to electronically create templates similar to the plastic ones found in an art supply store. These make it simple to copy, move, and duplicate frequently needed shapes or symbols. The software includes musical, architectural, mathematical, and electronic symbol template files. You can also design your own, and build a library of custom shapes.

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Electronic Finger

Light pens have been available for some time, but effective software to drive them has been seriously lacking. Inkwell Systems, the developers of *Flexidraw*, have produced both an outstanding light pen and integrated software.

After examining the specifications and internal construction of the light pen, I am convinced that it will probably outlast my 64. It carries a two-year warranty, but more significantly, it has a rated MTBF (mean time between failure) in excess of 91 years of continuous use. In fact, it's the same light pen that Inkwell System's parent company, Design Technology, Inc., supplies with a $500,000 CAD/CAM system.

The light pen and the 64 communicate via the VIC-II chip, which reads the horizontal and vertical positions of the pen when its tip touches the screen. Contact between pen and screen activates a tiny optical switch inside the pen. The pen's location is then read by a program. Since all of the software is written in machine language, it keeps the 64 well ahead of the fastest operation of the light pen.

ZOOM And Rubber-Banding

Flexidraw comes with a lot of advanced features. It offers two work screens, either freehand or point-to-point drawing modes, instant image inversion, and a rapid fill routine. Lines, circles, and rectangles require only two points to define their shape. The full assortment of 64 text and

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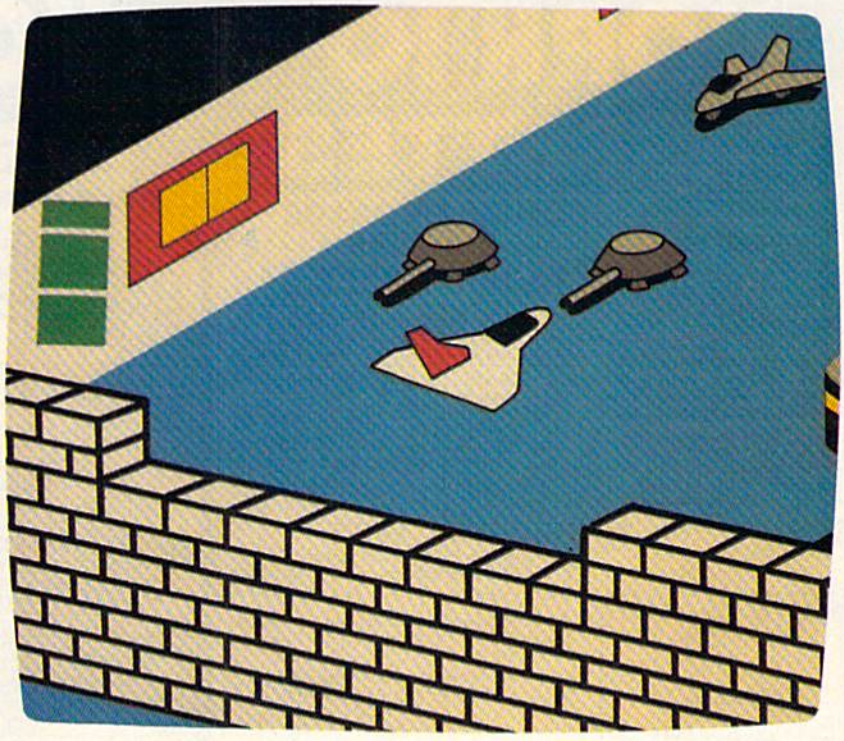

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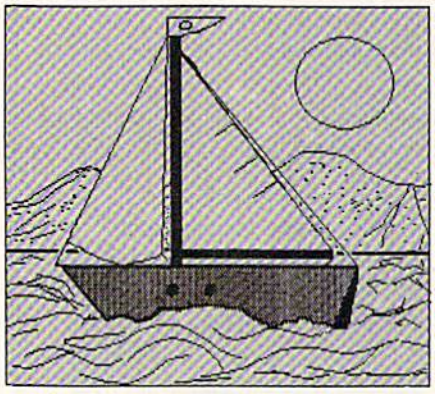

graphics characters are available to label your masterpiece.

If you like special effects, *Flexidraw* has several to make drawing more effective and fun. Zoom provides a 64 times enlargement which translates a pixel into a character-sized block. At this scale, it is easy to turn individual pixels on and off with the pen. Four-directional scrolling allows you to manipulate other parts of your image while in zoom mode.

A fun technique called "rubber-banding" facilitates drawing lines exactly where you need them. You do this by first fixing a starting point. A line is then drawn, erased, and redrawn from starting point to the tip of the pen. This gives you an animated display of the line on the screen. When you are satisfied with the position of the line, you either press a key or touch the LINE menu item to complete it.

The program allows you to draw using one of two grid sizes, or none at all. In grid mode you can also make use of the powerful GET and PUT commands. These are used to copy or move pieces of your drawing. GET copies all or part of your image into an invisible buffer. PUT copies the GET buffer onto one of your work screens.

The extent of the area to be copied is determined by positioning your light pen. For completeness, three different

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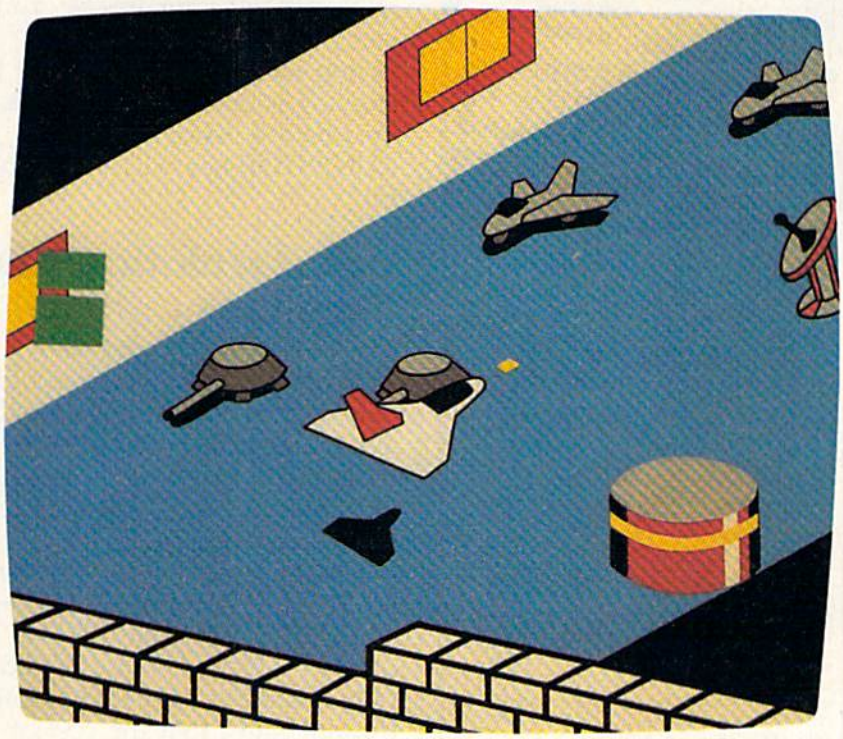
Other useful features include the previously mentioned templates, an averaging function, the spray mode, and crosshairs. Averaging allows you to draw smoother curves, while spray mode allows you to make dotted freehand lines instead of continuous ones. Crosshairs provide a full screen horizontal and vertical row of dots centered on your cursor position. This electronic T-square is useful for making



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many types of drawings requiring accuracy.

I found *Flexidraw* to be forgiving, too. It allows you to escape halfway through a process if necessary. Erasing is done by first inverting the image and then drawing on the inverted image. In this manner, you can erase any unwanted lines.

Other techniques allow you to erase specified sections of your image. Zoom mode provides precision pixel erasing. Some of the commands do require care in their use. The FILL command, for example, can ruin your picture if you are not careful. This happens if a break occurs in the region being filled. In this case, the fill can spill over most of your image. You can protect against this by saving your image on disk or by copying it into the other work area before using FILL. The RUN/STOP key will also stop a fill.

Documentation And Upgrades

The user manual is generally well written. However, I would have appreciated a separate quick reference card that summarizes the menu functions.

Inkwell strongly recommends that you return the registration card supplied to be informed of updates. System upgrade information and new product information are periodically mailed to registered owners. Inkwell states that the cost of upgrades will be inexpensive.

The newly introduced Micron Eye digital camera is currently being tested in conjunction with *Flexidraw*. Expect to see a telecommunication enhancement and other marvels in future products. Each addition will be priced separately.

Support Programs

Flexidraw is only one of several programs included in the set. *Flexiplot* allows you to draw lines and plot functions or geometric figures using BASIC. The shapes are fun to play with, and could be useful in learning geometry or calculus. *Flexiplot* images are accessible to *Flexidraw*. This feature makes it a snap to then label or otherwise manipulate your *Flexiplot* image.

Pen Palette, a high-res color painting program, features audio feedback and, of course, is light-pen driven. Animation of your color creation is also possible. Your artwork can be saved and recalled.

Another support program is *Transgraph*, which allows you to send and receive pictures via modem with other 64 users who have *Flexidraw*. *Transgraph* requires use of a 300-baud modem (such as the VICmodem, 1650 Auto Modem, and the HES-modem). The current version works only in black and white.

Also included are a sprite editor and animator, a light pen driven synthesizer, and a piano program. Each of these uses the light pen as a selection device, and are controlled from BASIC programs.

While *Flexidraw* is not a full-scale CAD (Computer Aided Design) tool, it is certainly an exciting development for Commodore 64 owners. *Flexidraw* is a 64 hi-res graphics system with

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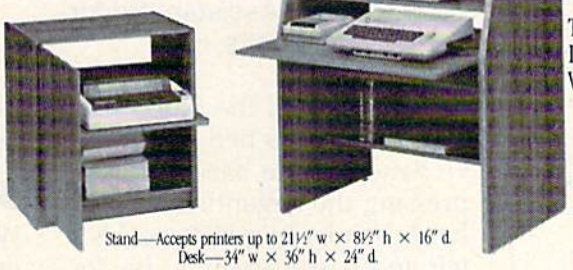

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International Soccer For The 64

Gregg Keizer, Assistant Editor,
COMPUTE! Books

It's the finals of the World Cup, and the score is tied at three. Holland has the ball, and is pressing the Argentinian defense hard. VanderTuig kicks to his left and passes easily to his forward, DeVries, who drives in toward the goal. He feints, throwing his hips one way, his shoulders another. The ball sails toward the goal, the goalie leaps to block, but the ball just brushes his fingertips. As it's snared by the net, the crowd jumps to its feet. The noise is deafening. And before the clock can run out, fans spill onto the field. VanderTuig embraces his teammate as they shout and scream together. The World Cup of soccer again belongs to the Netherlands.

Except for the names and the crowd-control problems, *International Soccer*, a game cartridge from Commodore for the 64, can easily duplicate this scene. Your players dodge, block, feint, run, pass, kick, and head the soccer ball. You have an entire field's length to work with, six players (one of which you control), a goalie, and a realistic soccer ball which even produces a shadow as it rises and falls over the playing field. If you've ever wanted to play soccer, but just didn't have the energy, or enough friends to field a team, or enough time to play, you'll find this arcade-quality game addictive.

Soccer In A Slot

When you turn the computer on, you see a title screen, and then, a few moments later, two colorful soccer players. If you do nothing, the computer shows you a demonstration game. Setting up the game, however, takes only a few key presses.

The function keys control the various selections you need to make when you first start *International Soccer*. The f1 key selects the uniform color of the right player (representing the team that begins the game defending the goal to the right). Pressing the f1 key repeatedly cycles through the six available uniform colors. Hitting the f3 key chooses the uniform color for the left player. Teams cannot use the same color uniforms and the computer makes sure this doesn't happen.

Use the f5 key to select the type of game you want to play. If you want to have a two-player game, don't press the key. If you can't find an opponent, you can play the computer by hitting the f5 key. The player on the right disappears and is replaced by a number. This is the skill level of the computer's team. Level 1 is fairly easy to beat, even by a beginner, while

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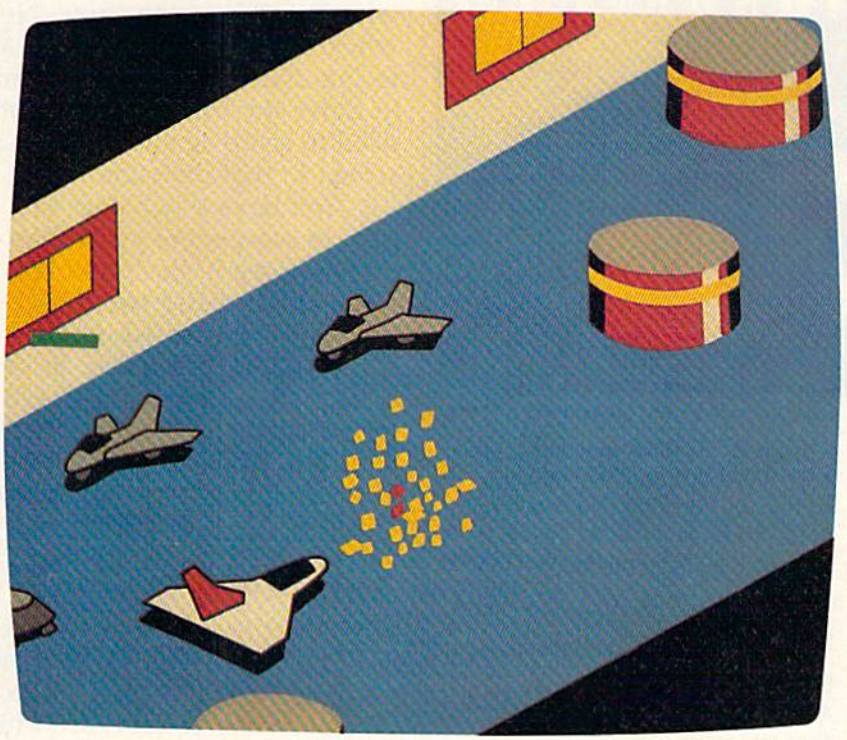

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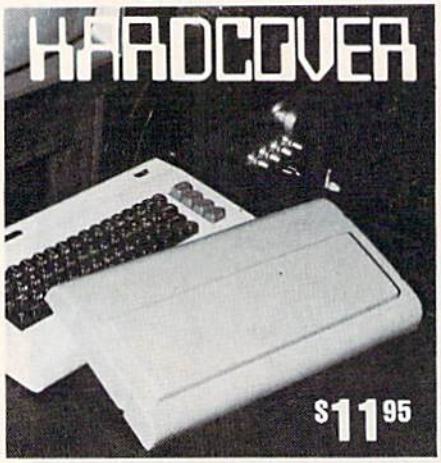

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level 9 seems to consist of the greatest players of all time. Unfortunately, since the computer is using them, you'll have a hard time of it unless you've played the game for quite a while. The last function key, f7, simply turns the players' uniforms to shades of dark and light, rather than bright colors. You could use this if you're playing on a black and white TV.

Once you've selected the colors and opponent, press the fire button on the joystick to start the game. (If you're playing against the computer, plug the joystick into port 2. You need two joysticks if you're playing against a human opponent.) The teams trot onto the field, line up, and wait for the whistle to begin the game. Note which direction your players are facing; that's the way you want to move the ball. The goal you need to score against is off the screen in that direction.

You have two halves of play to score more goals than the other team. Each half is three minutes and twenty seconds long (expressed on the clock as 200 time units). In between halves, the teams leave the field for the dressing rooms, then return. Goals are switched at the half, and possession also changes.

Run, Run, Run

The object of soccer, of course, is to score by passing, kicking, and running the ball toward your opponent's goal. You do that with the joystick. Although you have six animated players, you control only one at a time. That player, chosen by proximity to the ball, shows in a lighter shade of your team color. If your team color is yellow, for instance, the player you directly control appears in light yellow. Move the joystick, and this player moves in the same direction. Press the fire button to kick the ball in the direction the player is facing.

Players with the ball move slower than players without. You can actually catch a player with the ball from behind, and steal it away. Stealing the ball, almost an art in itself, is something best learned through practice. Usually, if you run beside the player controlling the ball, then cut sharply to the side or kick at the ball, you can take it away. You can even "head" the ball, bounce the ball off a player's head. (Remember that in soccer, you can't use your hands to touch the ball, unless you're the goalie.)

Since the field is larger than the screen, it scrolls as the ball moves left or right. If your controlled player runs off the screen, another player, the one closest to the ball, changes shades and is then controlled by the joystick. The ball is always on the screen. While you control one player, the others move in patterns, usually within a zone. Sometimes they're in the right position for a pass or a shot, other times they're not. The goalie is also computer-controlled. He always moves in the direction of the ball. To attempt a save, all you have to do is press the fire button. The goalie then leaps and tries to block the kick.

Sometimes you'll kick the ball out of bounds. When that happens, an opposing player

throws the ball back into play (overhanded, no less). Other times the goalie kicks it back into play, or a corner kick is made. To put the ball back into play, press the fire button if your team is throwing or kicking the ball. If you don't press the button, the throw or kick is made for you after a short pause.

Finesse And Timing

Winning an *International Soccer* game does not necessarily require brute strength or speed. You have to retain control of the ball, evade the defense, and pass often. Passing from one player to another is especially challenging. Timing is important here. Kicking the ball at the wrong time can give it to the other team rather than to a well-positioned member of your own team. And since a player without the ball moves faster, you have to constantly practice a downfield passing attack. If you simply run down the field with the ball, chances are your opponent will catch you before you get near the goal. However, if you pass downfield, running towards the goal at the same time, you'll have a better opportunity to get it to a player who's ready to take a shot.

Timing is just as important on defense. Waiting for the right moment to make your goalie leap for the ball, or stealing the ball at just the proper time, can force a turnover and give you the ball.

Joystick control is vital to playing a good game. You learn how to move your player, how to keep the ball away from the other team, how to pass and

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catch, how to deflect a shot on goal, and how to take possession on a corner or goal kick.

Position is also important. When the ball is thrown in from out of bounds, you need to move your controlled player into an area relatively free of opponents. Otherwise, you may lose possession of the ball. Watching for your other, computer-controlled, players is something you learn with time. Seeing an open man, you can pass the ball and be confident you'll retain control.

Just as in an actual soccer match, you need fast players, good moves, tough defense, and subtle attacks to score. Strategy may seem to be relatively unimportant at first, since so much of your team is not under your direct control. However, after you've played for some time, you'll begin to pick out ways to move the ball more confidently. There do seem to be patterns to the computer-controlled players, and you can make use of those patterns in passing the ball downfield.

Electronic World Cup

Graphically, *International Soccer* is impressive. The animation is realistic and smooth. The sight of the goalie diving for a block is memorable. He even lies on the ground for a moment, as if to catch his breath, before he's back in position. Constantly moving arms and legs, the three-dimensional look of the field, and the shadow beneath the ball all contribute to the excellence of this game's graphics. Sound, though not spectacular, does provide background. The crowd roars appropriately and you can hear the sound as the players kick the ball.

Realism isn't restricted to the animation, however. The game feels like a real soccer match. Your players run up and down the field several times before a goal is even tried, much less made. Play may seem compressed, but all the aspects of actual soccer are here.

Sports games on the screen used to consist of x's and o's which you could set up and maybe even move around. Then animated characters appeared, and you saw perhaps three or four moving at the same time. The rest just seemed to stand around, as if their contracts were up and they wanted to be traded.

This game is as similar to those video dinosaurs as contact football is to that game you once had where plastic players vibrated aimlessly across a shaking metal field. *International Soccer* is a true blend of arcade action and gaming skill. You don't just twist a knob and watch the blip slide across the screen. As in reality, you have to work to win. That's the fun of it.

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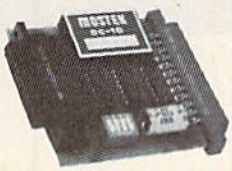

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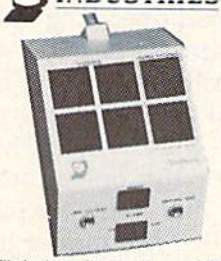

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Computer Thrillers

In Search Of A "Software" Michael Jackson

Fred D'Ignazio, Associate Editor

In my new COMPUTE! book, *Computing Together: A Parent's and Teacher's Guide to Computing with Young Children*, I introduce the concept of a computer "friend." The friend is a replacement for the average computer's dreary, unfriendly operating system (the part of the computer that helps you copy, save, and create files).

The computer friend is similar to the new Apple Macintosh's operating system. The Macintosh operating system pretends that it is an electronic desktop. On the screen are several familiar items you might see on or near a desktop, including pieces of paper, file folders, and a trash can. The Macintosh lets you perform computer operations by manipulating these familiar items by pushing a mouse around on the table. (The mouse is a cigarette-case-sized box with a "mouse tail" cord connecting it to the computer.)

The Macintosh operating system imitates a desktop. My friend operating system imitates a person. When the child turns on the computer and loads the disk, the friend's face appears automatically on the screen. At first, the friend's eyes are closed—the friend is asleep. But a bell rings and the friend wakes up and grins. "Who turned me on?" the friend asks.

The Macintosh has a *Finder* program that goes off and "finds" files for the person. The friend acts as a finder, too. The friend asks the child if he or she wants to play a game. If so, the friend presents the child with a list of games to play (a "file catalog"). Then the child gets to select his or her favorite game. The friend accepts the child's choice, goes off and finds the game and starts it running.

When the child is finished playing the game, the game automatically returns control of the computer to the friend. The friend asks the child if he or she wants to play another game. Or (with some additional commands) the friend might have a conversation with the child and talk about things that are important to the child.

A Computer With Personality

A computer friend program should not be dull. It should be loaded with personality. The friend's personality might stem from the personality of the designer. In the future we might see "designer friends"—like designer jeans. The personality of the friend would reflect the taste and interests of the friend's creator, the software design team.

We might see computer friends whose

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**Turtle Tracks $29.95.*
†Turtle Tracks also available in Atari, Apple and IBM versions. Square Pairs also available in Apple and Atari versions.

Poster, Secret Filer and Double Feature Mystery/Adventure designed and developed by Information Technology Design Associates. Turtle Tracks designed and developed by Thomas R. Smith. Square Pairs designed and developed by Glenn M. Kleiman, Teaching Tools: Software, Inc.

personality mimicked the personality of a famous movie star or cartoon hero. A family might be able to buy a Mickey Mouse computer friend, a Kermit the Frog friend, a Cat in the Hat friend, or even a Barbie-doll or G.I.Joe friend.

Or, akin to Spinnaker's *Facemaker* program and Designware's *Creature Creator* program, we might see friends that children could create themselves. There might even be a "Build-A-Friend" kit the family could use to install the friend's operating system on their computer.

A Program With Character

Of course, computer friends don't just have to reside in the computer's operating system. They can also come inside games and other programs that children run on the computer.

The key is that the character in the program must be so charming, so energetic and alive that it *leaps off the screen!*

How many programs have you seen with characters that do that?

In many computer programs (word processors, filing programs, and many games), there are no characters at all. All the action takes place in an artificial environment uninhabited by creatures of any kind, simulated or otherwise.

Many other computer programs contain characters, but they are so small, so narrowly defined, so one-dimensional that they are nothing that a child could warm up to. Most video games fit into this category.

There is a third class of programs that feature characters taken from personalities popular in other media. This is a type of "celebrity software." Unfortunately, in most cases the stars from film, TV, and children's picturebooks do not make a graceful transition to the computer screen. The visual appeal of the characters is substantially reduced, and the characters are relatively lifeless compared to their picturebook or cartoon counterparts. A child can move these dull, blockish characters around on the computer screen (with a touchpad, cursor key, or joystick), but what is the point? The experience, for the child, can hardly compare with the experience of a parent reading a good picturebook or watching a good film or animation.

Software clones of popular stars in other media are sure to be popular, but only because children (and adults) have a great hunger to interact with other lifelike creatures, as opposed to sterile, lifeless icons, spreadsheets, numbers, words, or geometric shapes.

What we really need is a talent hunt for fresh, new stars to grace the computer stage. We need software superstars that are as fascinating and lovable as Michael Jackson and E.T.

Stars Of The Computer Stage

We are seeing the first halting steps toward software characters with star quality. For example, there are the storybook programs, like *Robin's Halloween* and *Sammy the Sea Serpent*, from PDI, on Atari computers. There is Gertrude the Goose, who stars in *Gertrude's Puzzles* and *Gertrude's Secrets*, from The Learning Company. And there is a plump, silly dinosaur, Bagasaurus (or "Baggy"), from the *Learning with Language* package developed by the Children's Television Workshop for the Radio Shack Color Computer.

Here Comes Alf!

And then there's Alf.

Alf is the hero in a new computer game, *Alf in the Color Caves*, from Spinnaker Software. *Alf* is for children ages 3 and up. The first version of the game is for the Commodore 64. The Alf cartridge costs $39.95. For more information, contact:

Spinnaker Software Corporation
215 First Street
Cambridge, MA 02142
617/868-4700

Alf was created by Joyce Hakansson and Associates, Inc. Before setting off on her own, Hakansson worked for Children's Television Workshop and helped to create the excellent Sesame Street computer programs for the Apple II computers.

A lot of work went into Alf. Alf is a simple creature—all feet, head, and nose. But, boy, can he dance! *Time* magazine recently called Michael Jackson the Duke of Dance. Jackson has probably never heard of Alf. But Jackson had better watch out. Alf is a real contender. He is certainly the *electronic* Duke of Dance.

Alf bounces up and down on his giant feet, spins around, then whirls around, in break dance style, on his index finger. (I have no idea where this finger comes from. After all, Alf has no hands.)

Like Jackson, Alf doesn't just dance, he *acts*. His body is pure plastic. It vibrates, stretches, bends, and twists to the musical beat. His eyes are hilarious. Sometimes he half-closes his eyes and peeps out at you. Then he looks sneaky and mischievous. Other times he opens his eyes wide. Then he looks charming and innocent.

Alf is a comedian. Everything he does is funny.

The music Alf dances to is just as colorful as he is. It takes full advantage of the Commodore music (SID) chip. When you finish playing this game and walk away, you find yourself humming Alf's tune. It's like whistling the theme song from your favorite movie or favorite rock video from MTV.

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* Popular Computing, November, 1982
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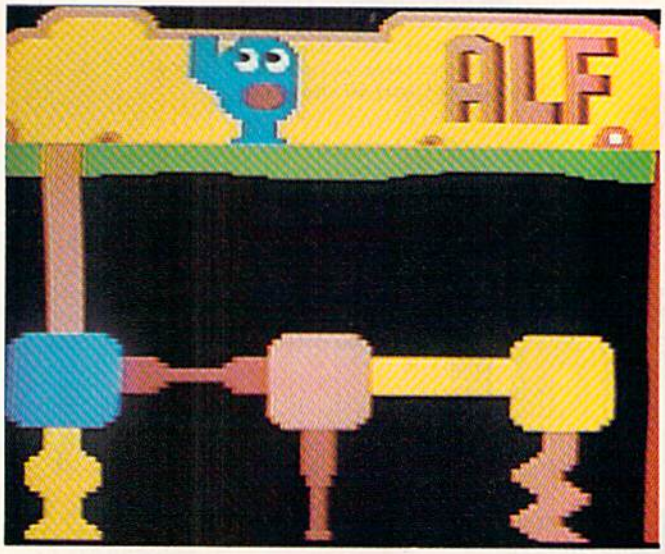

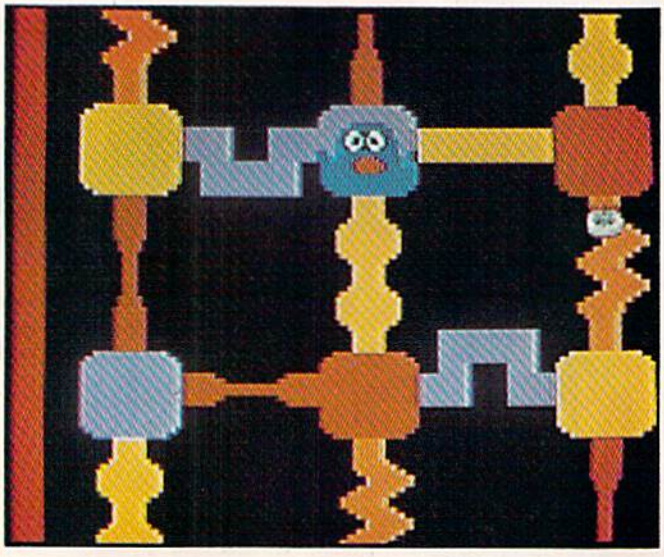

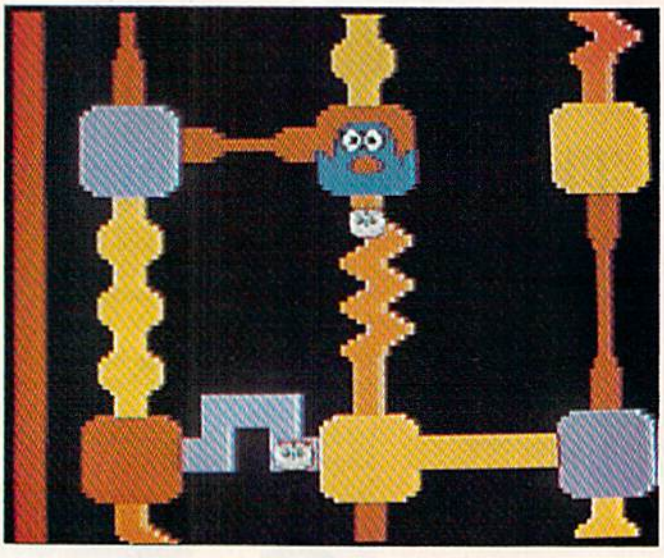

Software Movies

The action in *Alf in the Color Caves* is important because it can be controlled by a toddler. Unlike most other video games, small children can master this one.

A child uses a joystick to maneuver Alf through the mazelike color caves, while avoiding the shifty-eyed wufflegump creatures. Each time the child takes Alf through the caves, more of the wufflegumps appear. If Alf bumps into a wufflegump he automatically whooshes back to the top of the caves.

It is fun just to watch Alf. But it is a real thrill to control Alf's basic direction (he bumps and swings in all directions, no matter how you push the joystick). Alf is such a neat character, it is exciting just to move him around.

In fact, the *Alf* game is like a small, animated movie—an interactive movie. And the special effects in this movie are terrific. For example, Alf has to climb through passages with lots of different shapes. When he passes through the passages, his body squishes together, his eyes cross, and you hear special sound effects. When Alf passes through a U-shaped passage, it revolves around and around like a swinging door, and you can see poor Alf inside, getting dizzier and dizzier.

The Alf Story

Alf in the Color Caves comes with an illustrated book that explains the educational aspects of the game—how it teaches children cause-and-effect relationships, navigation skills, prediction skills, and pattern recognition skills. The book also has a section full of activities you can do with Alf.

But my favorite part of the book is "The Alf Story," in which we learn, in rhyme, that the grumpy wufflegumps don't just move, they "sniggle" and "slooze."

The story book is very brief, but it further convinces you that Alf is a real character. It is like the novelization of a good movie.

Good For Adults, Too!

It would be nice if children weren't the only people who got to meet Alf. Computer-anxious adults should also get the chance. Alf is so charming he might be able to help them forget their fears about computers.

Also (this is the idea of my friend Mary Umans), since it is easy for adults to maneuver Alf through the color caves, they can concentrate on interacting with Alf himself. Alf is so easy to move around that the adult doesn't have to worry about making a fool of himself. Instead he can concentrate on Alf and his funny twisting,

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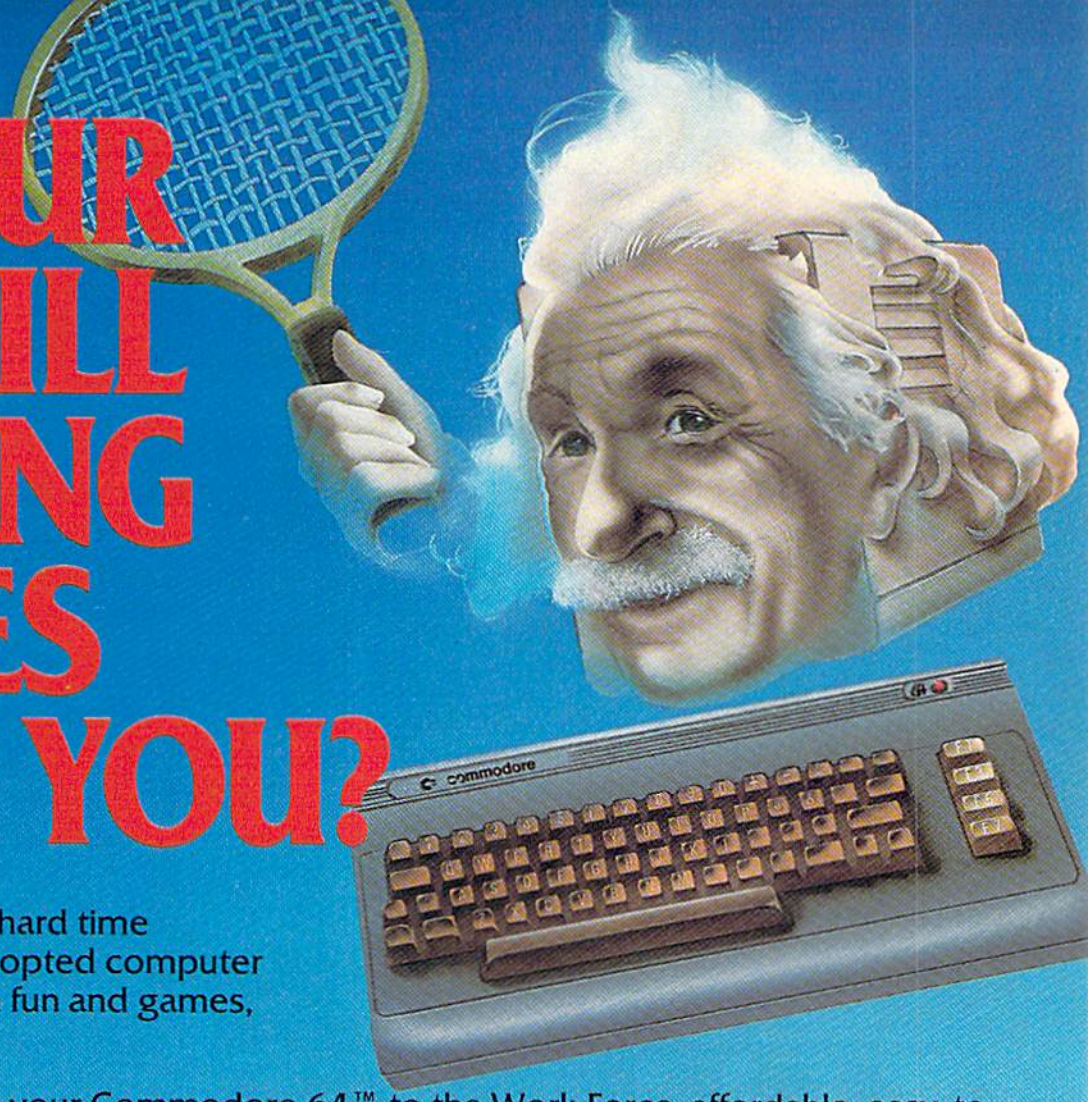

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bumping, and dancing.

Also, Alf gives an adult a chance to work with a computer on familiar terrain. Gone are the alien, shoot-'em-up video game worlds. Instead the adult feels like he has jumped, with both feet, inside a colorful, happy Walt Disney cartoon. This is a great place for an adult to start computing, and Alf makes a perfect companion.

Encore!

Alf is not the ultimate software superstar. But he is a good beginning.

A software character, like Alf, should be so charming that you want to keep returning to the character's world and accompany the character on new adventures. At the end of each game, when the character is done performing, you will want to cry, "Encore! Encore!"

Software characters could be very profitable for a software publisher. If the character delights the public, they will be hungry for sequels, trilogies, even sagas, all involving that same character and set in that character's world.

So, Joyce, what are your plans for Alf? He's cute enough to star in his own series. Hopefully he'll be back soon, dancing across our computer screens.

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SIMPLE ANSWERS TO COMMON QUESTIONS

TOM R. HALFHILL
STAFF EDITOR

Q A

Each month, COMPUTE!'s GAZETTE *tackles some questions commonly asked by new VIC-20/ Commodore 64 users and by people shopping for their first home computer.*

Q. *What exactly is a memory map?*

A. The term implies that it is some kind of road map of the computer's memory. Actually, a memory map is more comparable to a telephone book or city directory. A memory map tells you what occupies each *memory address* in the computer.

There's a common analogy for explaining computer memory addresses. Imagine a very long street lined with houses. The house numbers range from 0 to 65535. That is, the first house on the street is numbered 0, the second house 1, and so on—up to the last house, which is numbered 65535.

The memory inside your Commodore 64 or VIC-20 is arranged very similarly. There is a long series of memory locations ("houses") numbered sequentially from 0 to 65535. Each number is a memory address corresponding to a certain memory location (just as a street number corresponds to a certain house). The terms memory address and memory location are used synonymously.

A memory map tells you the significance of those memory locations. Each house along our imaginary street has a mailbox for sending and receiving letters. In the same way, each memory location is like a mailbox which holds a number between 0 and 255. Do not confuse this number with the memory address. Think of it as a mailbox with the street address on the outside and a piece of mail (a number) inside.

For example, memory location 211 in the VIC-20 and Commodore 64 normally contains a 0 when you first switch on the computer. You can see this for yourself. BASIC has a command called PEEK which lets you "peek" at the contents of any memory location (picture yourself peeking into the mailbox of the house with street number 211 on our imaginary street). After you first switch on the computer, type:

```
PRINT PEEK(211)
```

Now press RETURN. The number 0 is printed on the screen. That means memory location 211 is occupied by a 0. But what does this signify? Without a memory map, you don't know.

Memory maps are available in the VIC or 64 *Programmer's Reference Guide* and in many other books. (We also publish maps from time to time in our magazines.) By consulting one of these maps, you can learn that memory location 211 always contains a number which indicates the current horizontal position of the cursor. The number 0 indicates the left margin of the screen. The right screen margin would be 21 on the VIC-20 and 39 on the Commodore 64. Sure enough, if you look at your screen, the cursor is blinking on the left margin—position 0.

Maybe you're still wondering why it might be important to know this. Who cares which numbers are at which memory locations? People who write programs care, because it's also possible, in most cases, to *change* the number which occupies each memory location. By changing a number, sometimes you can modify the operation of the computer to suit your own purposes. Type this:

```
PRINT "HELLO" [press RETURN]
```

The word HELLO is printed at the left screen margin. That's because the number 0 which occupies memory address 211 told the computer to print the word at position 0 on the screen. But you can control the computer. There's a BASIC command called POKE which lets you put a number into a memory address (like delivering mail to a house on our imaginary

street). Here's how to put the number 5 into memory address 211 and make the computer print the word HELLO indented five spaces:

```
POKE 211,5:PRINT "HELLO" [press RETURN]
```

The colon is just a separator which lets you put more than one command on a single line. When you press RETURN, the computer prints HELLO five spaces from the left screen margin. (However, the blinking cursor returns to the left margin, because the computer automatically puts the number 0 back in address 211 after it's done. You can check this by entering PRINT PEEK(211) again; the 5 you put there is gone, replaced by the 0.)

There are many tricks you can perform by changing numbers in memory locations. Because there are no sound and graphics commands in Commodore BASIC, you must use this method to play music, create sound effects, draw and move sprites, and so forth. The best way to learn these techniques is to read books and articles which describe how programs work, to study programs, and to experiment on your own. A memory map is an invaluable guide to learning your way around your computer.

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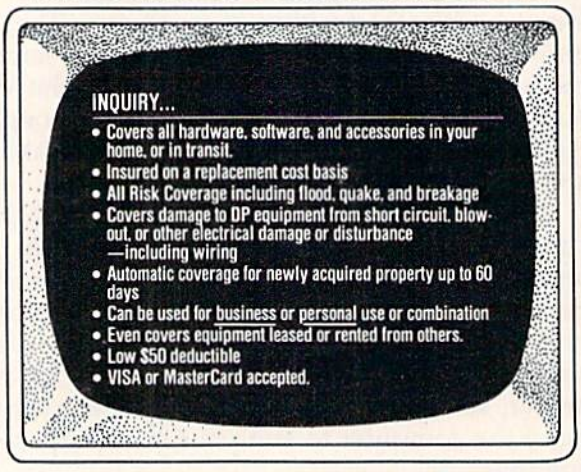
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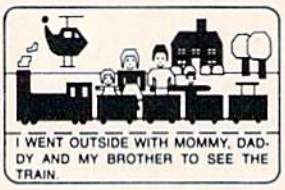

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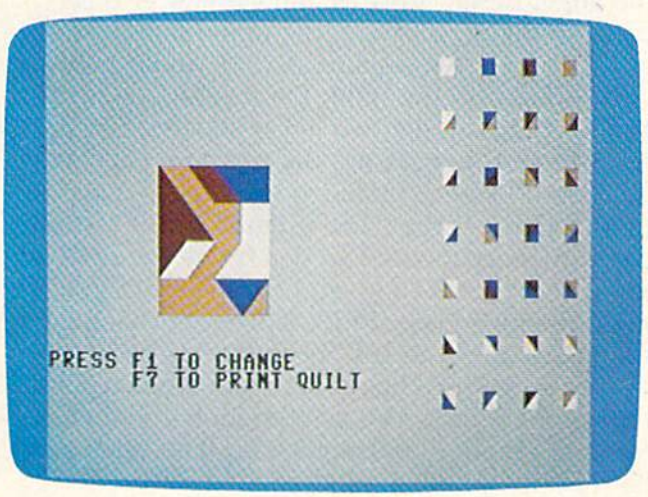
Quilt Squares

Have you ever drawn a small pattern, then wondered how several repetitions of the pattern would look? A patchwork quilt, for example, can consist of a few small designs repeated in different combinations. This month, we'll use the graphics and color capabilities of the computer to let you choose possible patterns, change them if you wish, then see your pattern repeated on the screen.

First you are asked how many colors you want to use. You have your choice of two, three, or four colors. On the VIC-20, one color must be white, so you can choose one, two, or three more colors. Next you choose which colors you want—press a number which corresponds to the colored square shown. On the 64 you may choose from 0 to 9, and on the VIC you may choose from 1 to 7.



First, you design a quilt square, using a variety of shapes.

Two Basic Patterns

The screen clears, and all possible combinations of the colors appear on the screen. Only squares and right triangles are used in this quilt design. In the center of the screen is an enlarged quilt square which is made up of 16 smaller patterns (each 2 by 2). One by one you place patterns in each of the 16 blocks. A question mark appears on a block of the enlarged pattern. You choose one of the small patterns to place in the block.

Press f1 to move the cursor to the pattern you want, then press RETURN. The cursor always begins at the first pattern and cycles through all the patterns. After the last pattern the cursor goes back to the first. When you press RETURN to indicate your choice, that pattern is placed on the main block. The question mark then moves to the next square. This process continues for the 16 squares.

After you have completed your pattern, you may alter it if you wish. Press f1 if you want to make any changes, and f7 if you are happy with your design as it is. If you press f1 to change the pattern, the computer will go through the 16 blocks again. If you want to leave the block the way it is, press RETURN. If you want to change the block, press f1.

You may choose another pattern by repeatedly pressing f1 until the cursor is on the pattern you want. Then press RETURN, just as you did when you initially designed the quilt square. After you have had a chance to change all 16 squares, the computer again asks if you want to change the pattern (f1) or print the quilt (f7).

When you are satisfied with your pattern, press f7 to print the quilt. The squares are repeated on the whole screen. Now you can have fun "quilting" on your computer without all the hassle of cutting little squares and triangles then piecing them together (hoping the seams will match).

PEEKing And POKEing The Graphics Shapes

The variable M in the VIC version and LF in the 64 version relate the screen memory map to the color memory map. To display a graphics character on the screen, you need to POKE the screen memory location with a number representing the screen display code.

You also need to make the character appear by POKEing the color memory location with a color number. In the "Quilt Squares" programs, the screen memory locations for the possible patterns are in the Q array, and the screen memory locations for the main designing square are in the S array. The screen display codes or character codes of the possible patterns are in the R array.

In the subroutines to draw the graphics on the larger design squares, the variable A is set equal to the S() location, the upper left location of the two-by-two square. A + 1 would be the next location to the right. On the VIC, A + 22 and A + 23 are the two lower squares. On the 64, A + 40 and A + 41 are the two lower squares.

The PEEK command is used to see what is in a certain location. The program PEEKs at the color memory location to determine the color of the pattern piece so it can be transferred to the main design square. PEEK is used in changing the quilt pattern to get the characters in a two-by-two square so the square can be blinked and replaced. PEEK is also used to look at the character in the main design square so the design can be repeated in other areas of the screen.

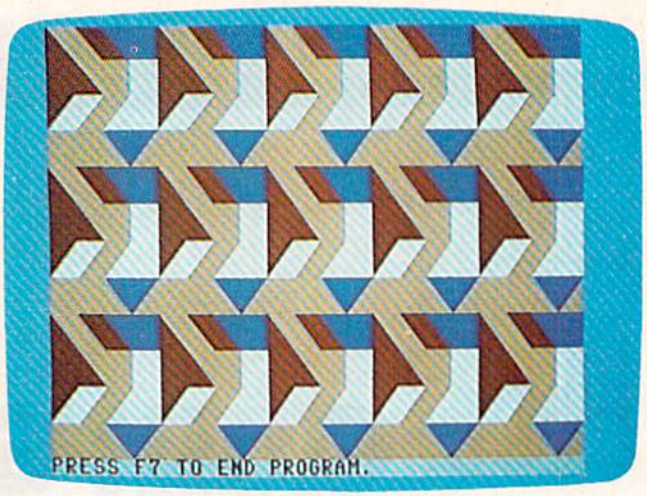
Extended Background Colors

I wanted to use squares and triangles for the basic quilt pattern pieces since they are the most common shapes in real quilts. Notice, however, that if you have more than two colors, you need to have several different combinations of colors in the triangles. Usually you can POKE a graphic character on the screen (such as 95 for a triangle) then POKE a color number.

The triangle will be the color POKEd, and the rest of the square of that character is the regular background color. The extended background color mode is used to get a square with two different colored triangles on the 64.

This type of graphics is slightly different because, instead of 128 screen display codes of the alphabet and graphics symbols (or 256 with the reversed mode), we are limited to the first 64 characters. By POKEing multiples of 64 plus graphics character numbers, we can display the character with different background colors.

For example, if we POKE a screen location with 18 (and the color memory location with a color number), we'll see an R with the regular



The screen is then filled with your pattern in the 64 version (VIC version similar).

background. In extended background color mode, if we POKE a location with 18 + 64, we'll see an R with background color #2. If we POKE the location with 18 + 128, well get an R with background color #3. You can see this is exactly what we need to be able to use four different colors in a quilt design with all possible combinations in the triangles.

```
POKE 53282,C(2)
POKE 53283,C(3)
POKE 53284,C(4)
```

puts the colors C(2), C(3), and C(4) into the different color registers.

```
POKE 53265,PEEK(53265) OR 64
```

activates this extended background mode.

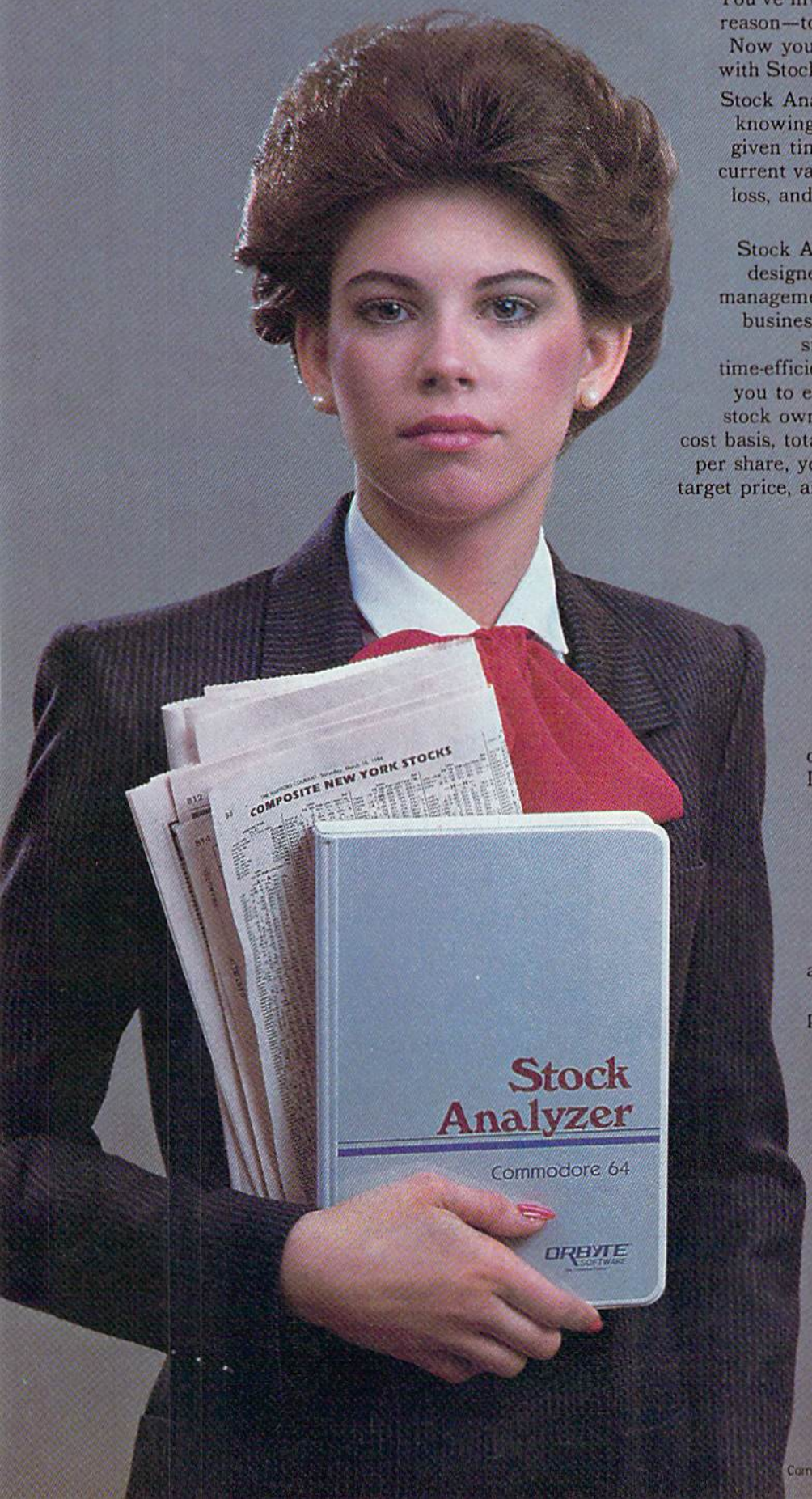
Using Custom Characters

There is a limitation, however. To use these extra backgrounds, we have only the first 64 characters of our screen display characters—the alphabet, some symbols, and the numbers, but no triangles. Custom characters to the rescue! Since I wasn't going to print any symbols in the program, I can change #, $, %, and & to the triangles I need. These are character codes 35, 36, 37, and 38. While I was at it, I changed () [] and £ to graphics used in other parts of the program.

To use custom characters, we transfer the regular character definition set from ROM to RAM, and alter the characters we need. We then tell the computer to look to the new location in RAM instead of ROM to find any character definitions—any letters we print or any characters we POKE onto the screen.

This process is contained in lines 330–380 of the 64 version of the program. POKE 56334,0: POKE 1,51 turns off the interrupts and turns off the video chip to expose the character generator; and POKE 1,55: POKE 56334,129 turns them

Your Investment Advantage



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back on. Lines 350 to 370 look at each address in ROM and transfer the number to RAM. It takes a little over 40 seconds. POKE 53272,19 tells the computer to look to the new addresses in RAM for the characters.

Reserving Character RAM

Before we can use this process, we need to save a place in RAM for the new character set and make sure it is protected from the BASIC program. Therefore, you must type in

```
POKE 8192,0: POKE 44,32: NEW
```

before you use the procedure. This sets the start of BASIC pointer to 8192. Notice that we start our new character set at 2048.

Before you start typing this program, type the above commands in. Also, after you have saved the program and later want to use it, the procedure would be:

1. Turn computer on.
2. Type POKE 8192,0 and press RETURN.
3. Type POKE 44,32 and press RETURN.
4. Type NEW and press RETURN.
5. Type LOAD "QUILT",8 to load the program from disk, or LOAD "QUILT" to load from tape.
6. Wait for the program to load.
7. Type RUN and press RETURN.

Defining New Characters

The new characters are defined using lines 460–500 and the data in lines 510–600. Each character is made up of 8 dots by 8 dots. The numbers in the DATA statements indicate which dots are colored in. As you are typing in the DATA statements, be sure that each line has eight numbers separated by commas. Be sure there is not a comma at the end of a line.

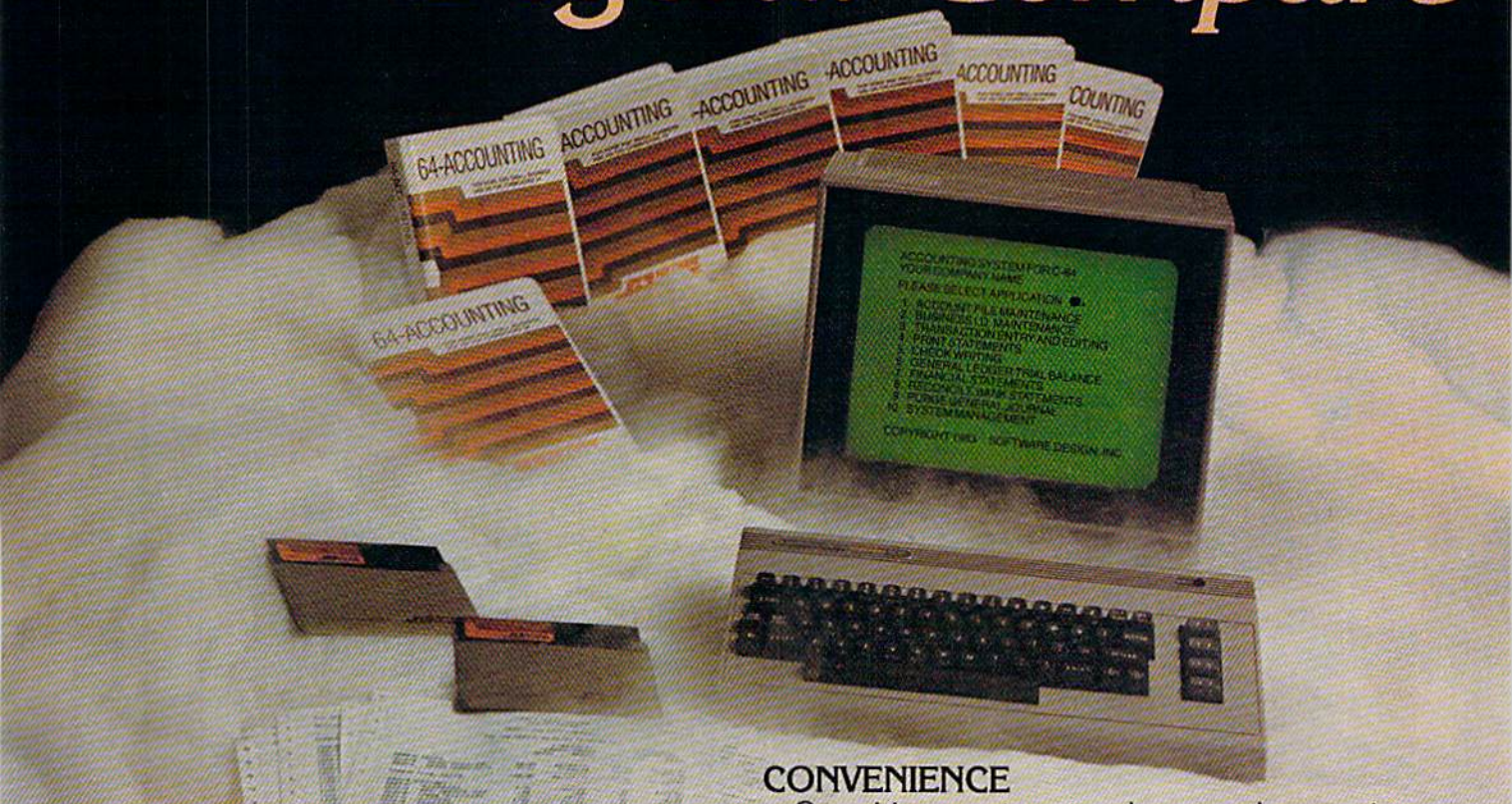
With the new characters designed now, we can use the character number to POKE the design to the screen. With the different background colors, we need to be careful which numbers we choose. For example, character 35 will be a triangle with the regular screen background color. 35 + 64, or 99, will be a triangle of the POKEd color with the second background color. 35 + 128, or 163, will be the triangle with the third background color. 35 + 192, or 227, will be a triangle with the fourth background color.

The subroutines in lines 30 to 300 could be written more efficiently using mathematical relationships, but I kept each subroutine separate so you could see how the color numbers CC and the character numbers are used to get different combinations.

VIC-20 Program Flow

Lines	Explanation
2	Branches past subroutines.
3	Subroutine to clear keyboard buffer and play tone.
4–9	Subroutines to draw shape on larger square.
10	Subroutine to keep track of shape in larger square.
11	Subroutine to draw shape on four squares either replacing the basic square or printing the repeating design.
12	Subroutine to draw large cursor to indicate which square is being changed.
13	Subroutine to put color on large square.
14	Subroutine to clear messages.
15	Prints title.
16	Dimensions variables. S() is screen location of large square (upper left location). Q() is screen location of possible quilt shape at top of screen. R() is character number of the shape. QQ() is the number of possible shapes for 1, 2, or 3 colors chosen.
17–18	Print instructions.
19–23	Read data to define variables.
24	Initializes variables QQ(), V for sound, and M for relating screen location to color memory location. Turns on volume for sound.
25	Defines A$ and B$ used for printing the basic sixteen squares.
26–29	Ask for number of colors N to be used in design.
30–38	Receive your color choices.
39–40	Clear screen, print squares to be designed.
41–45	Draw possible shapes that can be used in design.
46–54	Basic loop to choose design for 16 squares.
46	Clears keyboard buffer, beeps, prints question mark on current square.
47	Cursor moves among possible designs. P is the color.
48–49	Blink shape while waiting for your response.
50	If you press RETURN, branches out of loop.
51–52	If you press f1, goes to next shape. After going through all shapes, the process starts with the first shape again.
53	A is the screen location. I is the shape number chosen. The appropriate subroutine draws the right shape in the large square.
54	Colors the square; goes to next square.
55–57	Present the option to change the pattern or to print the quilt.
58–59	If option to change is chosen, clear question and print new instructions.
60–73	For each of the 16 squares, you can press f7 to leave the square as it is or f1 to change. If f1 is pressed, you then choose one of the possible shapes as before, pressing RETURN when the new choice is made. After all 16 squares, the instructions are erased and the program goes back to line 55.
74–86	If you press f7 to print the quilt, the computer checks each of the 16 squares and draws the shape in other positions on the screen to create the repeating design. Three loops and IF statements are used because all 16 squares are not repeated in each section of the screen.
87	Moves cursor to the next-to-the-bottom line.
88	END.

64 Software Beyond Compare



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64 Program Flow

Lines	Explanation
20	Branches past subroutines.
30–300	Subroutines to draw shape in 2 × 2 square.
310–320	Print message.
330–380	Transfer character set from ROM to RAM.
390–410	Change screen to light grey and print title.
420	Dimensions variables. S() is the screen location for the 16 basic design squares (upper left square). Q() is the screen location for the possible design patterns. R() is the character number for the possible design patterns.
430–450	Print instructions.
460–600	Redefine custom characters for triangles and cursor shapes.
610–620	Clear sound memory locations.
630	Turns on volume and sets type of sound.
640	Defines high frequency HF, low frequency LF, and waveform W.
650–660	Define A$ and B$ for drawing basic design square.
670–750	Define variables S(), Q(), and R().
760	Defines QQ() as the number of possible patterns depending on the number of colors chosen.
770–800	Determine number of colors desired.
810–890	Determine colors desired.
900	Clears screen.
910	Sets alternate "background"colors.
920	Sets extended background color mode.
930–1250	Print possible patterns for squares.
1260–1290	Print basic square for designing.
1300–1490	Basic loop for choosing pattern and printing it on main square for 16 squares.
1310	Sounds prompter tone.
1320	Prints question mark on square.
1330	Goes through possible patterns.
1340	Sounds prompter tone.
1350–1360	Determine color of pattern.
1370–1380	Blink pattern square while waiting for response.
1390	If you press RETURN, branches out of loop.
1400–1410	If you press f1, goes to the next pattern square.
1420	After going through all possible patterns, cycles back to first pattern square.
1430	Sets A for starting coordinate to draw main square.
1440–1470	Draw appropriate pattern.
1480	Colors pattern on main square.
1490	Goes to next square.
1500–1550	Present option to change pattern or print quilt and branch appropriately.
1560	Clears printing.
1570–1590	Print instructions for changing pattern.
1600–1850	For each of the 16 squares, lets the user press RETURN for no change or goes through the possible patterns to change a square; procedure is similar to previous selection.
1860	Clears printing.
1870	Branches back to line 1500 for option to change.
1880–1960	Loop to repeat pattern to draw quilt on screen.
1890	Sets coordinate A for screen location.
1900	Determines four characters for the design in one square.
1910	Determines color.
1920–1950	Draw square in other positions on screen.
1960	Repeats for 16 squares.
1970–2010	Wait for you to press f7 to continue.
2020–2030	Subroutine to clear keyboard buffer and sound prompting tone.
2040	Subroutine to color design square.
2050	Subroutine to determine characters used in design square.
2060	Subroutine to draw design square; used either in blinking square during change option or repeating pattern on whole screen.
2070–2090	Prints ending message.
2100	END.

Saving VIC Memory

I like to write programs using the computer with no extra peripherals or extra memory. This program is no exception. It works with the standard VIC with no memory expansion. Naturally, it cannot be the same as the Commodore 64 version. I decided to conserve memory by not using multicolor mode and custom characters (although both are available on the VIC), so this limits your design to all triangles adjacent to white, which is the screen color. (You can, if you prefer, add a line or two to change the screen color.)

This means that there are only four possible triangle designs for each color, which simplifies the number of subroutines needed to draw the main triangular design squares (lines 6 to 9). The solid squares are drawn in lines 4 and 5.

If you prefer not to have READY appear on the screen at the end of the program, you may change line 87 to 87 GOTO 87, then press RUN/STOP to end the program, or change lines 87–88 to

```
87 GOSUB 3
88 GET E$:IF E$=""THEN 88
89 PRINT "{CLR}":END
```

The program waits until you press a key before clearing the screen and ending.

When you type in the VIC version, be sure to leave out all unnecessary spaces to conserve memory.

If you prefer to save typing effort, you may receive a copy of this program by sending a copying fee of $3 plus a blank cassette or diskette and stamped, self-addressed mailer to C. Regena, P.O. Box 1502, Cedar City, Utah 84720. Please be sure to specify the title and which computer version you want.

See program listings on page 149.

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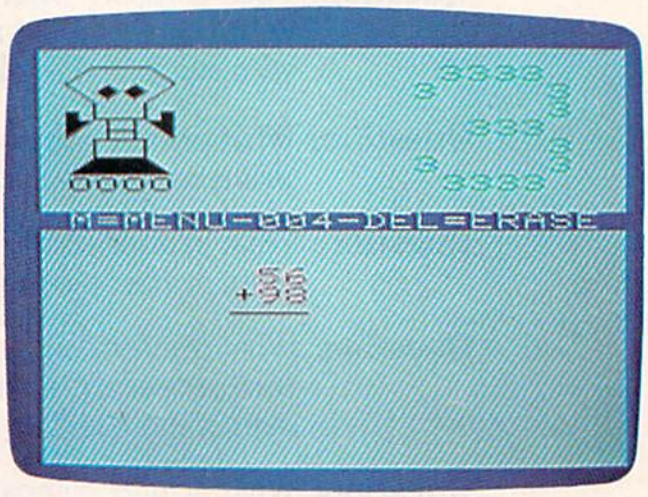
Robot Math

Bob Stewart

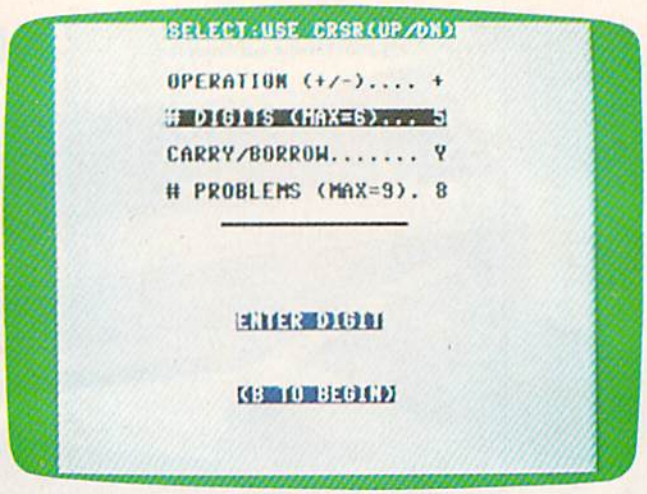
Learning arithmetic can be exciting and fun, as well as a visual delight for children when you use this educational program. Originally written for the VIC, we've added a version for the 64.

Although the popular use of computers in schools and homes has created a barrage of educational software, much of it fails to take into account many factors which make a learning program truly valuable.

Is the program inflexible—the same drill over and over? Is it easy to use? Are there options to streamline the program for children of various learning levels? And, just as importantly, is it fun for the child? "Robot Math" tries to answer each of these questions in a positive way.



A correct answer to a problem is rewarded by the robot, who toddles across the screen and changes the problem number (VIC version).



The menu lets you tailor the program to the child's learning level (64 version).

Defining The Program From The Menu

After typing in and running the program, you'll see a menu with instructions on how to use it. Cursor up or down to choose one of the menu items: operation (+ or −), number of digits (up to six), carry/borrow (yes or no), and number of problems (up to nine).

Simply press RETURN to change the operation or carry/borrow options after you've cursored to those items. You can also change the number of digits or number of problems. When you're satisfied with the menu choices, press B to begin.

The Shifty-Eyed Robot

After the first problem is presented, the timer begins. The number of the problem appears at the upper right corner of the screen, directly across from a shifty-eyed robot. Three minutes or three tries are allowed for each problem. A correct answer is rewarded by the robot, who toddles across the screen and introduces the next problem by updating the number.

If time runs out or if three incorrect answers are entered, the right answer is given, and a new problem is presented.

You can return to the menu at any time by pressing M, or you can delete any digits in your answer with the DELete key.

VIC Notes

In the VIC version, very little memory is available after the program is run. In fact, you'll need to use abbreviations to get some of the lines to fit. In line 9, use the abbreviation T SHIFT–H for THEN.

The program is self-modifying. This means that once you have configured the program with the menu and have entered the drill mode by pressing B, you may interrupt the program using RUN/STOP and then save the program along with the selections you've made. This self-modifying feature can be found in lines 75 and 76. These lines change the data contained in line 91 by printing a new line 91 on the screen in white letters (which aren't visible) followed by the command RUN1.

Line 76 POKEs three RETURNs (CHR$(13)) into the keyboard buffer followed by an END. The program is actually stopped by the END statement, which then causes BASIC to look into the keyboard buffer for further instructions. The first RETURN encountered by BASIC enters the new version of line 91 previously placed on the screen by line 75. The second RETURN skips one line, and the third enters the RUN1 command just as if you entered it from the keyboard. This causes the program to start at the beginning.

See program listings on page 153.

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Commodore's New Speech Module: Magic Or Technology?

Betsy Byrne

Until very recently, speech simulation devices for home use were not much more than curiosities—and very expensive ones at that. Two years ago, a speech synthesizer box cost around $300, and was only useful to the person willing to invest a large amount of time into learning the complex programming skills needed to coax semi-intelligible words from it.

A year ago the prices dropped somewhat, and to make your synthesizer speak you now had a rather cumbersome "editor" program based on creating words from parts of speech known as phonemes. If you had a good ear, and a knack for phonics as a child, you could construct phrases and speeches to amaze your spouse and amuse your friends.

Like the original Model T Fords, your computer's voice came in any style you wished as long as it was monotone—with little or no variation in pitch or inflection. It was also difficult to have anything else going on while the computer was orating, since the speech synthesis methods ate up huge chunks of the computer's memory.

As a Commodore owner, I wish that Commodore could take credit for being the first to come up with the revolutionary technology that is changing the way that people think about personal computer voice synthesis—but the laurels go to Texas Instruments. The type of chip that was designed for *Speak and Spell*, and later used with the TI-99/4A, was refined and perfected by a group of wizards in Texas. It is not an exaggeration to say that when *Speak and Spell* hit the market, it set up a ripple that has become a sizable wave, and before it is finished, may very well become a veritable tsunami of new ideas and products "speaking" in schools and homes, factories and businesses.

Commodore did the next best thing to inventing the technology—they hired a chief wizard and some of his friends from Texas Instruments. Richard Wiggins was installed as head of the Commodore Speech Technology Division in Texas to design and perfect a speech module for Commodore computers. The result is the Commodore Magic Voice Speech Module, and I think that Commodore users will be very pleased indeed when it becomes widely available this summer.

Modeled On The Human Voice

Wiggins used a chip that is based on a technique called Linear Predictive Coding (LPC)—a totally different process than that of the Votrax chip that most of us are familiar with from the speech synthesizers of years gone by. In general terms, the LPC process is designed to model the vocal tract, to which is added the actual digitized recording of a real human voice. After the digitized recording has been entered, it's then possible to analyze and change the pitch, volume, and frequency content of the signal—and generate very high quality speech. It is the LPC method that allows the

Magic Voice to be able to speak as a variety of characters: man, woman, child, or monster. And all may be programmed from one set of data.

Asked why the LPC technique was chosen, Wiggins said, "We didn't want to produce a 'curiosity,' something that is just purchased as a gimmick." He elaborated, "We wanted a workhorse speech module that would do *useful* things—teach young people to read, or enable them to learn foreign languages."

The Magic Voice itself has a few surprises in store for Commodore users who up to now have only seen Votrax-based units or the clever, disk-based SAM for their computers. Magic Voice is as clearly understandable as the magic toys from TI—but it speaks with the voice of a woman when you install it in your 64. This may or may not be a revolutionary move on Commodore's part, but it is an educationally sound decision. Numerous studies have shown that at the elementary school level, children respond better to, and learn significantly more, with a woman's voice instructing. According to a spokesperson at Commodore, "Education is one of the major uses we foresee for the Magic Voice."

Added Commands

The voice comes with a built-in vocabulary of 235 phrases, and adds additional commands to Commodore BASIC to make it easily programmable. It's programmed using complete words—or a number that is associated with each word—and the most useful added command is "SAY." SAY is used with syntax almost identical to PRINT, with a few important exceptions. In a program (or direct mode), you cannot use a string of vocabulary words with SAY:

```
10 SAY "HI THERE"
```

will not work. You must set up a separate statement for each word, as in:

```
10 SAY "HI":SAY "THERE"
```

A way around this is to use DATA statements or look-up tables.

Another new entry on the BASIC list is the RATE command, which varies the speed at which the word is spoken. This is a very important capability—you only have to listen to the variations in speed in your own speech to understand how important. Careful use of the RATE command can make all the difference in the naturalness and understandability of the sentences you program with Magic Voice.

RDY (ready) is a command that allows you to check from within a BASIC program to see if the module is "ready." Wiggins had some advice to programmers about using the RDY feature: For your program to work on systems that do not have the module inserted, you must set RDY to zero, and save the program *without* the module plugged into your 64. The program will then run with or without the Magic Voice.

Software Support

Commodore has also developed talking software for the Magic Voice. Two Bally Midway arcade games, *Wizard of Wor* and *Gorf*, will soon be talking back to their owners. These games illustrate the character-voice capability of the module as they sound off with phrases sure to inspire competitive zeal. Included is the most sinister and bone-chilling laughter I have ever heard.

Next comes the first in a series of programs for preschoolers starring the Commodore bee. Dubbed *A Bee Cs*, this cartridge program teaches children to recognize both capital and lowercase letters. Kids use the joystick to fly the bee to the letter as directed by the voice—and when "Terrific!" is heard for a job well done, little faces shine with a glow of confidence. You may have guessed that my kids liked it. Available soon will be *Spelling Bee* and *Counting Bee*.

The Magic Voice module plugs into the game port (not the user port) and has a slot in the top to allow you to "piggyback" cartridges. All the software designed for the module is slated to appear on cartridge.

Although phoneme-based speech construction and text-to-speech are well within the capabilities of the Magic Voice, it will be a few months until software unlocking these features is available. A prototype of the text-to-speech program was introduced at last January's Consumer Electronics Show.

The impressive capabilities of Commodore's Magic Voice seem to prove that speech technology is now emerging from a long infancy, and is taking the first strides toward the day when we will not remember that, once upon a time, our computers could not speak.

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MACHINE LANGUAGE FOR BEGINNERS

RICHARD MANSFIELD, SENIOR EDITOR

What Is Machine Language?

If you've had a computer for even a short time, you've heard about machine language (ML). You know that most popular commercial software—games, word processors, spreadsheets—is written in ML. You may also know that there are dozens of computer languages in which to write programs for Commodore microcomputers, including Forth, Pascal, C, Logo, even mutants like COMAL. Why, then, do the professionals nearly always choose to program in machine language?

The answer is simple: speed. Computers are, by nature, fast. But, if you ever try to write an arcade style game in BASIC, you'll soon discover that you cannot construct a BASIC game which executes swiftly enough. No matter how efficiently you write your game in BASIC, no matter how much you optimize it for speed, it won't be fast enough. That's because many events are going on simultaneously in a complex program. And professional games and other commercial software are usually full of features and events. The one thing which distinguishes professional from amateur programming is the rich complexity of the former. And the speed which supports such complexity.

Why is ML so fast? Because it's the only language which doesn't need some kind of translating before the 6502 chip can understand it. This chip is the "brain" of Commodore machines, and ML is the machines' language. BASIC, by contrast, is designed to interact comfortably with humans. BASIC has English words like STOP and END for its commands; ML uses less obvious commands like LDA and STX.

Imagine Zanzibar

Imagine that you've accepted a job in Zanzibar. Should you learn the language? It depends, of course, on your job. If you're going to be painting the sunsets, you can probably get by with an interpreter. If you're going to be in charge of helicopter rescue missions, you'd better learn to speak the language—there won't be time for hand signals and charades during an emergency.

Likewise, whether or not you go beyond BASIC to learn your machine's native language depends on what your purposes are in working with your computer.

Perfectly respectable budgeting, household management, recipe file, and checkbook balancing programs can be written in BASIC. Most such programs spend most of their time waiting for a human to INPUT information. Speed never becomes an issue. In fact, millions of people are comfortable with the things they can accomplish in BASIC. It is the first and only computer language they will ever learn.

If, instead, you are interested in writing more sophisticated programs—programs with the ultimate in speed, grace, and power—you must learn the machine's language. Only then can you take it to its limit.

How Hard Is It To Learn?

ML is much easier to learn than most people suspect. Anything not yet understood seems forbidding and complicated. It's interesting that the first microcomputer programmers (circa 1977) bought computers like the venerable AIM and SYM which had so little memory space that there wasn't any room for luxuries like BASIC. These programmers had to learn ML. It took them, on average, about as long to learn ML as BASIC takes most of us to learn today. And when they went on to BASIC, they found that it took the same amount of time to learn BASIC. Conclusion: Both languages can take as long to learn.

That's not too surprising when you consider some of their similarities. They both have about 50 command words. Of that 50, only about half are commonly used. (When was the last time that you used WAIT or ATN in a BASIC program?)

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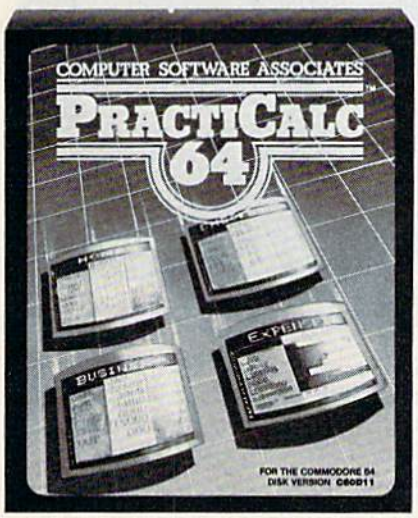

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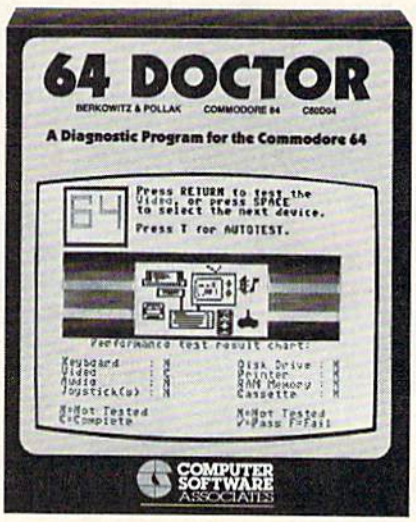
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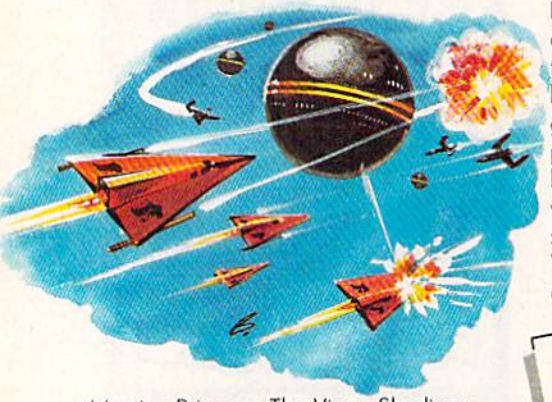

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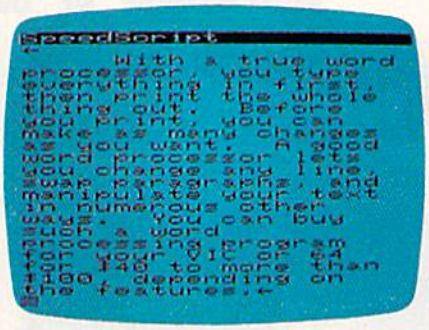

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And, like any computer language, they are both composed of various combinations of the three primary computer structures: loops, branches (like GOTO), and variables. Part of the process of learning BASIC involves grasping these fundamental structures. And, just as it's easier to learn French if you already know Spanish, it's easier to learn ML if you already understand what loops and branches and variables do in a computer program.

How Is It Done?

It's getting easier all the time. The latest assemblers (the ML programming language) are so close to the environment in which BASIC is programmed that many tasks are accomplished automatically now. In the pioneer days (1977 and earlier), the tiny home computers didn't have memory space for an assembler either. So ML programs were hand assembled. This meant that each instruction had to be entered as a number rather than as a command.

Here's how it works. Suppose you want to put the letter *A* on the screen and your screen RAM starts at address 1024 (as on the Commodore 64). In BASIC you could do it several ways:

```
10 PRINT "A"
10 PRINT CHR$(65)
10 POKE 1024,65
```

The number 65 is the code for the letter *A*. In ML, you would do something similar to the third example above: 169 65 141 0 4. This series of numbers is an ML program which contains commands to the 6502 chip. Mixed in with the commands are addresses and numbers. Just as POKE 1024 is a command/address pair, the ML numbers are in pairs. The 169 65 pair means LDA #65 (LoaD the Accumulator with the number 65) and the 141 0 4 means STA 1024 (STore the Accumulator at address 1024). This series of numbers might not mean much to us, but they are very clear to the 6502 chip. If you POKE in that number series (anywhere there is some free RAM memory to hold it) and then SYS to that address—you'll see an A appear on screen.

An advanced assembler lets you write an ML program like:

```
10 LDA #65:STA 1024
```

which is a lot easier than writing it in pure numbers like 169 65 141 0 4. Just as BASIC can compose a program out of POKE and PRINT instructions, an assembler puts together an ML program out of instructions like LDA and STA. To learn ML, you need to learn its instructions and the ways that you can use numbers and addresses with those instructions.

An Undeserved Reputation

ML's reputation for difficulty derives from the fact that doing it without an assembler used to require tremendous patience and attention to detail. Also, many of the earlier assemblers were not especially considerate of the programmer's needs. There were no variables (called labels in ML lingo), no line numbers, and, above all, few error messages.

BASIC shows you where you made a mistake. It says SYNTAX ERROR IN 675 and you can just study line 675 until you spot the oddity. But assemblers have been improved so much that now the better ones will provide you with similar error messages. They will show you exactly where many kinds of problems are located. They also allow unlimited variable names, they use line numbers, and they include many other conveniences and kindnesses.

Some highly evolved assemblers even let you use your BASIC utilities with them like line renumbering, variable find/replace, autonumbering, program merge, and any other programming aids that you've found helpful when writing in BASIC.

Try ML. You'll discover that it's not significantly harder to learn, to understand, or to use than BASIC.

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HORIZONS: 64

CHARLES BRANNON
PROGRAM EDITOR

New Hardware

We've been using Commodore's new SX-64 portable computer for about a month. It's a very interesting product. Basically, the SX-64 (sometimes called the Executive 64) is a combination of a Commodore 64, a 1541 disk drive, and a scaled-down 1702 color monitor, all in one box that can be snapped together and carried away with a handle. It weighs 20 pounds, which doesn't sound like much until you heft it—it's one heavy load to cart around.

The SX-64 is almost completely compatible with the 64, and is almost identical in terms of hardware. Commodore has changed the operating system in trivial ways—the default screen colors are blue on white (like the VIC-20), which seems to be a better color combination on the small 5-inch monitor (more about that later).

Setting up the SX-64 is easy. The keyboard is like a faceplate that snaps off, revealing the screen and disk drive. A short cable connects the keyboard to the main unit. Plug it in, turn it on, and you have a ready-to-run computer system.

The SX-64 is available in many places for under $800. This makes it comparable to the price of a 64 put together a component at a time: $200 for the computer, $250 for the drive, and $250 for the 1702 color monitor add up to $700. So for a little more money, you can have a 64 you can take anywhere.

It's worthwhile to mention that the SX-64 is portable in the same sense as a portable television. You can carry it to any location with a wall outlet, but don't expect to use it in your car or on the beach. A better word for this type of computer is *transportable*. True portable computers, such as the Radio Shack Model 100 or the Gavilan Mobile computer, can run off of internal batteries and can truly be used anywhere.

The disk drive acts just like an in-line 1541. But no, it's not faster. There's still a serial cable somewhere inside connecting the drive to the computer. I suppose that adding a parallel, direct-circuitry connection would introduce differences in the memory layout and operating system so that some programs written for the 64 would not work on the SX-64. The only programs we've had trouble with are those that depend on the default screen colors to be light blue on dark blue, as on the 64, or those that call for cassette access.

That's right. The SX-64 has no cassette port. As a matter of fact, the operating system has been changed to give an ?ILLEGAL DEVICE NUMBER ERROR when you try to load or save to tape. This is understandable. If you have a built-in disk drive, why add to the cost of the SX-64 by making the cassette port available? On the other hand, this limitation may matter to you.

Passing The Endurance Test

We've worried about the reliability of a disk drive that is carried around a lot. 1541s don't like to be moved—some of the drives here at our offices have died from being transported back and forth to work. Disk drives in general can be rather delicate. Even the drives in the original Osborne 1 would sometimes need readjustment after a lot of toting about. Well, after a month of testing, our fears seem to be unfounded. To thoroughly test reliability, various staff members took the SX-64 home with them every evening, and brought them back the next morning. After much use (and inevitably, some abuse) the SX-64 is still going strong. It has no problems with either reading or writing to disks. If the drive is not identical to the 1541 (which some service technicians have noticed), it is definitely compatible with disks formatted on other 1541s (within reasonable limits).

The keyboard has a different feel than a 64. The keys are half as high, and tend to make a clacking sound, whereas the 64 keyboard has a very soft touch. Some editors here disliked the keyboard until they got used to it. People tend to seize upon differences and make them into issues.

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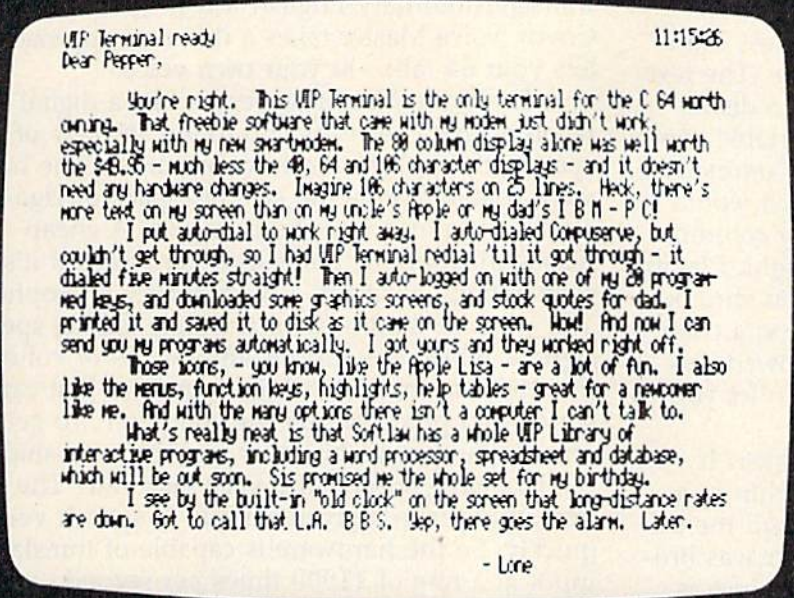
VIP Terminal ready
11:15:26
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I put auto-dial to work right away. I auto-dialed Compuserve, but couldn't get through, so I had VIP Terminal redial 'til it got through - it dialed five minutes straight! Then I auto-logged on with one of my 20 programmed keys, and downloaded some graphics screens, and stock quotes for dad. I printed it and saved it to disk as it came on the screen. Wow! And now I can send you my programs automatically. I got yours and they worked right off.
Those icons, - you know, like the Apple Lisa - are a lot of fun. I also like the menus, function keys, highlights, help tables - great for a newcomer like me. And with the many options there isn't a computer I can't talk to.
What's really neat is that Softlaw has a whole VIP Library of interactive programs, including a word processor, spreadsheet and database, which will be out soon. Sis promised me the whole set for my birthday.
I see by the built-in "old clock" on the screen that long-distance rates are down. Got to call that L.A. B B S. Yep, there goes the alarm. Later.
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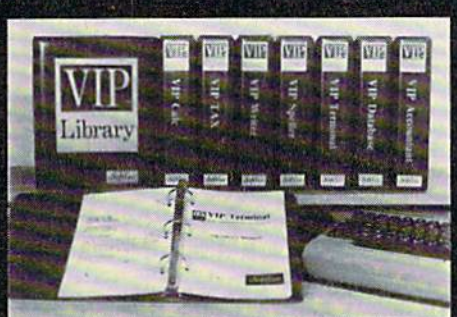

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AUTHOR'S SUBMISSIONS ARE ENCOURAGED.

In practice, the keyboard is just as usable and has a good feel. But the 5-inch screen is a different matter—some people cannot adapt to it, others find it acceptable.

A Trade-Off?

The SX-64 screen is often complained about. Subtracting the border area gives you less than four inches (diagonally) of screen space. The text is readable, but I find it very difficult to distinguish slashed 0s from 8s. No other portable computer, however, has a color screen. If Commodore had used a monochrome screen, the text would be quite readable. As it is, cramming forty columns into four inches makes things a little tight. Playing games is also strange with all the action shrunk down. The SX-64 can still be attached to a color monitor, such as the 1702 (or 1703, nowadays), but there is no built-in RF modulator to let you attach it to a home television.

Another caveat is the built-in speaker. It seems a crime to attach a synthesizer chip to a tiny, noisy speaker. The first time I heard the SX-64 playing music, I thought the speaker was broken, until I heard another unit that was just as bad. Again, there is nothing to prevent you from playing the sound through your stereo with the appropriate cable.

The cartridge port is not in the back where you'd look for it, but under a trap door on the top of the unit. The doors open as you insert a cartridge. I've tried several cartridge games, as well as the CP/M cartridge, and all work properly. Some large expansion cards designed to rest horizontally don't look right sticking up into the air, but that's just aesthetics, I guess, unless you want to plug in one of those card-cage expansion boxes.

Commodore hasn't been manufacturing very many SX-64s, given the demand for VICs and 64s, but there seem to be more of them every day. If the SX-64 catches on, Commodore may find they have another big money maker. If I hadn't already purchased a home 64 system, I would probably have bought a portable version instead. We're still working with the SX-64, and I'll let you know if we find anything more of note. In the meantime, if you have an SX-64, write me and tell me how it's working out for you.

More New Hardware

For those of you who like "neat hardware," you'll want to take a look at a new kind of voice synthesizer. We've watched the price of hardware speech synthesizers continually go down as the features go up. There's the Votrax Type-N-Talk, one of the first affordable speech boxes, the Voice Box from the Alien Group, even a speech synthesizer that requires no additional hardware—Software Automatic Mouth from Don't Ask Software. And there's Commodore's own Magic Voice module (due to be released any time now). These voice synthesizers accept *phonemes*, the basic phonetic units of speech, which are used to build words. Some units have built-in hardware that translates ordinary English text to speech. But the Covox Voice Master takes a different approach. It lets your 64 talk—in your own voice!

The Voice Master system is like a digital tape recorder that can record up to ten seconds of speech, then play it back in any order. The hardware is about twice the size of a pack of cigarettes, and plugs into the user port. A cheap plastic microphone plugs into the box, but it's easy enough to attach a high-quality microphone. The work of the box is to translate analog speech signals, which are various amplitudes of volume, into discrete four-bit volume numbers that can be stored and processed by the computer. To get any reasonable quality, however, you have to analyze the incoming speech at a very high rate. The volume changes in a given sample of speech very quickly. So the hardware is capable of translating input at a rate of 11900 times per second.

At the heart of the hardware is an analog-to-digital (A/D) converter. The paddle ports on your 64 are also A/D converters, which translate a continuous sweep of voltage from the paddle (which ranges from 0 to 100 ohms) to a single binary number from 0-255. So you could use the paddle ports (which are attached to the SID chip, of all things) for the same purpose.

As a matter of fact, Covox will have a simplified version of the Voice Master that uses the paddle ports to attach a microphone.

So the Voice Master hardware is mainly a high-speed analog-to-digital converter. The Voice Master software reads the incoming digital signals and stores them into memory. There is only so much memory available on your 64. The Voice Master gives you 16K of BASIC space, and uses the rest for ten glorious seconds of speech. I know that ten seconds doesn't sound like much, but take out your stopwatch and talk for ten seconds. You can read a paragraph in that much time.

The Voice Master software lets you partition sounds as words. Recording starts when a sound is heard, and stops when you stop. Each segment can be stored as one of 64 words. This is where the software interface really shines. Look at this simple program:

```
10 CLEAR
20 LEARN 0
30 SPEAK 0
40 GOTO 20
```

When run, this program repeats everything you say. The SID chip is used to output the

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sound, so you hear it from your TV or monitor. New commands, such as LEARN and SPEAK, are added to BASIC to make programming very easy. With SPEED, you can vary the speed of playback from 1 (slowwww) to 9 (remember the Chipmunks?). VOLUME is used to clip the output volume from a range of 1 to 15. Fifteen is the normal setting. If you use VOLUME 10, all sounds recorded with volumes greater than 10 will be forced to a volume of 10. This can improve a noisy recording. With various POKEs, you can modify the recording rate (the faster you sample, the better the quality; but at higher speeds, memory is used faster, and you have less recording time).

Whatever You Want To Sound Like

I've heard of similar devices that cost many times more than the Voice Master's modest $90, but I was really surprised at the quality of speech. At the default sampling rate, the voice sounds like one from an out-of-town AM radio station, or the Space Shuttle calling to Houston. At the fastest rate, the sound is very intelligible and clear. It really is like a digital tape recorder.

You can do more with the Voice Master than write a copycat program. Several interesting programs are included on the disk. One is a talking calculator. When you first run it, you "teach" the software how to say the digits from 0 to 9, decimal point, multiply, divide, etc. You can then type out simple calculations, with your typing spoken to you, as well as a spoken answer. Again, it's in your own voice, which is an interesting psychological experience.

An extension of this concept is the talking clock. After you give it all the pronunciations of numbers and AM/PM, as well as an alarm message, you can have the spoken time of day by pressing the space bar. Your own voice tells you the time of day.

It's important to note that you only need the hardware to record. The Voice Master hardware is not required for playback. The software alone plays the recorded speech from memory. So you could really surprise a friend by sending him a program of yours that talked to him in your own voice! There is the complication of copyrights. The software that plays back speech is still copyrighted by Covox, although it is strictly one-way without the hardware. Covox is working on licensing the software to developers for a royalty of something like 25 cents per disk.

Music And Sound Effects

You are not limited to speech. The Voice Master box will accept any input and play it as a word. I've recorded short songs from the radio, and invented a vocabulary of special effects—boings, beeps, whizzes, and explosions. If only so much memory wasn't used, it would be the perfect way to design sound effects for games. The Voice Box works with the same principle used in those new audio compact discs. The music is encoded digitally, but at a much higher rate, of course.

In the future, Covox will be offering new software that allows voice recognition. That's right—your 64 will be able to act on spoken commands. Here's how it might work. You speak the same word ten times. Although we say the same word differently every time, there are similarities. So the software analyzes the ten samples and finds the correlations. The next time you speak, the word is compared to the library to find the word in memory that matches most closely. Sure, it's limited and arbitrary, but even limited voice recognition is fascinating. And it won't take any more hardware. Covox already has a system working that can recognize the digits and other simple words.

Some voice synthesizers have a built-in library of words that were recorded digitally, then analyzed by mainframes to remove all unnecessary information in order to compact the speech into a mininum of ROM space. With the Voice Master, you aren't limited to an arbitrary vocabulary. You can create special vocabularies for different applications. I wrote a program with the Voice Master software that lets you create a general-purpose vocabulary. You type in a word, then speak it. The word is played back, and you can re-record it to get it to sound right. Then, after you've built up a list of words, you can type sentences using the words, which are then spoken as a complete sentence.

The implications are interesting. Using someone's own voice and a sample of his vocabulary, you can invent statements that appear to have been said by the person you previously recorded. This is not just playing back what they've said, but creating new sentences from individual words that the person may have never actually spoken. Of course, the sound quality wouldn't fool anyone, but what could be done with million dollar equipment? It's a little frightening, the idea of a computer being used to put words into your mouth. That's why it's important for everyone to be aware of current trends in computer science—to prevent abuse of this technology. And with microcomputers available to a growing number of people, we control this technology.

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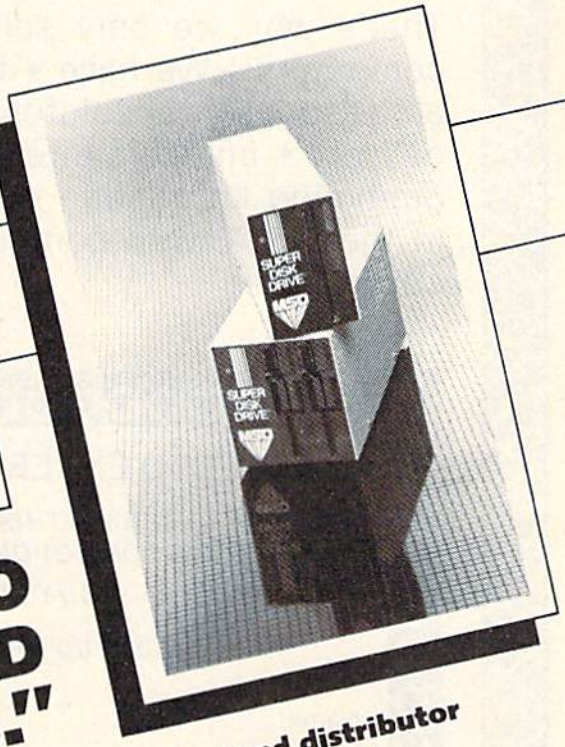

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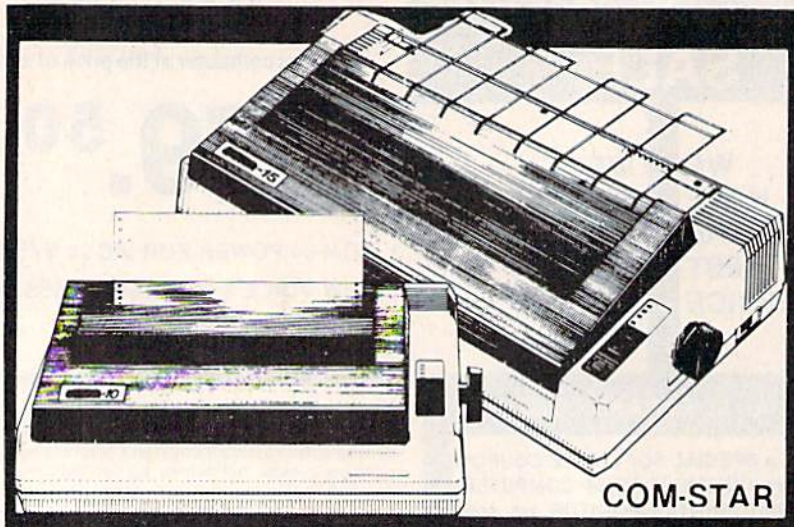

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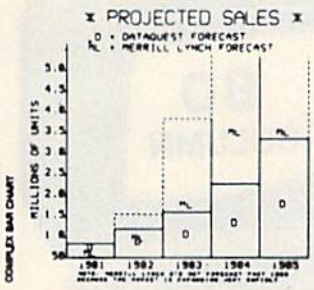
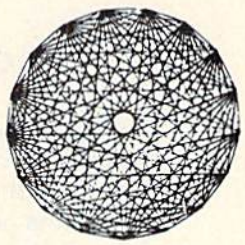


ACTUAL PRINT SAMPLES

UPPER CASE - ABCDEFGHIJKLMNOPQRSTUVWXYZ

LOWER CASE - abcdefghijklmnopqrstuvwxyz



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Color Chart

Sheldon Leemon

Check out all the possible combinations of character colors and background colors with "Color Chart." For the VIC and Commodore 64.

One of the nicest things about color graphics on the VIC and 64 is that you can choose the color of each character that you print. This allows you to place many different colored text statements on the same screen at one time. When you begin to design a screen with more than one text color, however, you often run into a problem. Many text colors do not show up well against certain background colors.

Often, trial and error is the only way to discover which text color goes well with which background color. Wouldn't it be nice if you could see all of the combinations of text colors and background colors on the screen at one time? You could then see which combinations would work best in your program.

The two programs accompanying this article, one for the VIC and one for the 64, do just that. The VIC version has sixteen rows of eight characters each. The top row has a black background (color 0), and each row below has a different background color with a higher color value. The column at the extreme left has a black text character, and each column to its right has a different color text character with a higher color value. The 64 version is the same, except that on the 64 there are 8 additional text colors, so there are sixteen columns, and a total of 256 color combinations.

Using The Computer's Speed

But how is it possible to show more than one background color on the screen at one time? After all, the background color is determined by the value in a memory location called the color register (the 64 uses location 53281, while the VIC uses 36879). Since this register can only hold one number at a time, the only way to have more than one background color at a time is to change the value of this register in the middle of the display.

To understand how this is done, you have to know something about how a picture is displayed on your TV. An electron beam called a raster starts at the top left corner of the screen, and moves in a horizontal line from left to right. As this beam moves, it lights up appropriate parts of the screen line. When it gets to the end of the line, it goes back to the left side, drops down a bit, and starts all over again.

It takes about two hundred of these lines to complete your computer display, and the raster scans all of these lines sixty times every second. If you tell it the exact instant to change the background color, it can do it after part of the screen has already been drawn.

Interrupting The Raster Scan

Both the VIC and 64 have a raster register. This is a memory location which holds the number of the line which is currently being scanned. The short machine language program in each of the examples just loops around, waiting for a particular line at the top to be scanned. When that happens, it changes the background color, and waits for a few more lines to be scanned until it changes the background color again. When all of the changes are done, it goes back to the beginning and waits for that first change again.

Type the program in carefully and save it before you run it. The program will loop around continuously, displaying all of the color combinations available to you. See which combination you think will be the best for your particular program, make a note of it, and then press RUN/STOP–RESTORE to break out of the program.

See program listings on page 135.

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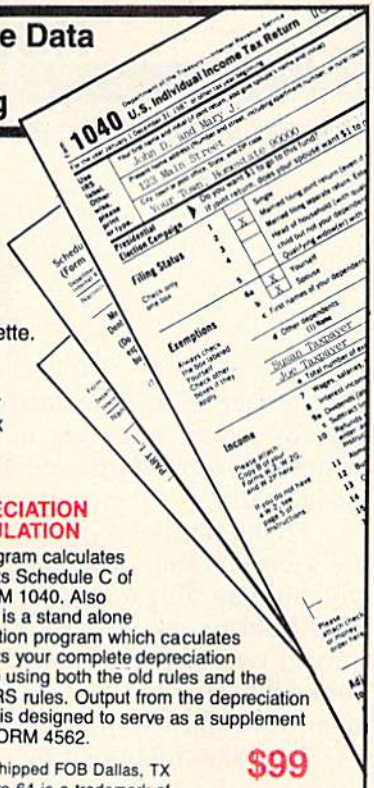

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NOTE: Printing on government forms requires friction feed printer.

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ROBERT SIMS, ASSISTANT EDITOR

Downloading

On the face of it, downloading is a simple procedure by which you receive data from a remote computer via modem, and store it to disk or tape for later use.

That's the theory, anyway. The trouble with the theory is that downloading is simple the way wrestling an alligator is simple: All you have to do is hold its mouth shut and sit on its back—a simple, two-step procedure. But anyone who thinks it's easy has never wrestled an alligator fresh from the swamp.

To make downloading easy, you have to wrestle with *conversion* and *integration*.

In home telecommunications, most information is transmitted as ASCII (American Standard Code for Information Interchange) characters. As the name indicates, these character codes are a standard by which different brands of computers can communicate.

Transparent Conversions

When you are on-line, your computer (called the *terminal*) is connected to a remote computer (the *host*). The information transmitted between the two is converted at least twice. When the host sends information, it converts the data from the computer's internal code into ASCII, which it then transmits to your computer. Your terminal software converts ASCII into a Commodore variation called CBM ASCII (or PETASCII), which your VIC-20 or 64 can process. When your computer sends data to the host, the process is reversed.

These conversions are *transparent*, which means they take place without any intervention on the part of the user.

Downloading, however, is not transparent; it requires that the user have a basic understanding of how and where data is stored on the host, how the data is processed by terminal software, and how the data is converted after it is downloaded.

Information on bulletin boards and information networks comes in three forms: files containing text, files containing program listings, and loose data. Loose data includes the bulletin board messages, menus and prompts, help files, and command descriptions which tell you how to use the system.

A Dead Volkswagen

The whole purpose of downloading is to retrieve such information for your own uses. Often, this means the data must be manipulated in some way, edited perhaps, or merged into another file. And this is where the wrestling match takes place.

To illustrate the problems that may arise, let's suppose that one afternoon my Volkswagen dies; the fuel pump just quits working. That night, I log on to the local bulletin board to read the messages and find one that contains detailed instructions on how to repair a Volkswagen fuel pump.

This is important information, and I desperately need a copy. But it's too long to copy by hand; I can't take the computer to the garage so I can read the instructions while I work on the car; and my landlord won't let me bring a Volkswagen into my apartment. Fortunately, my terminal program has download capability.

Capturing The Data

Most terminal software downloads data through the *capture buffer*. I type in the control sequence which opens the buffer (with my software, I hold down the Commodore key and press the letter O). When the buffer is open, the terminal program notifies me by displaying an arrow or a BUFFER OPEN prompt. When I'm sure the buffer is open, I type in the bulletin board commands to have the Volkswagen message displayed again. When the host transmits the message, the terminal program displays it on the screen and stores it in the buffer.

While the buffer is open, I also download a message announcing the date of the next user group meeting. Then I close the buffer, SAVE the contents to disk, and log off. (Some software saves the buffer to disk after you log off.)

Next I load and run a word processing program, call up the message file from disk, make a note of the user group meeting in my appointment book, and erase everything except the Volkswagen repair tips. These I send to the printer. Now I'm ready to take the printed instructions out to the garage and bring my Volkswagen back to life.

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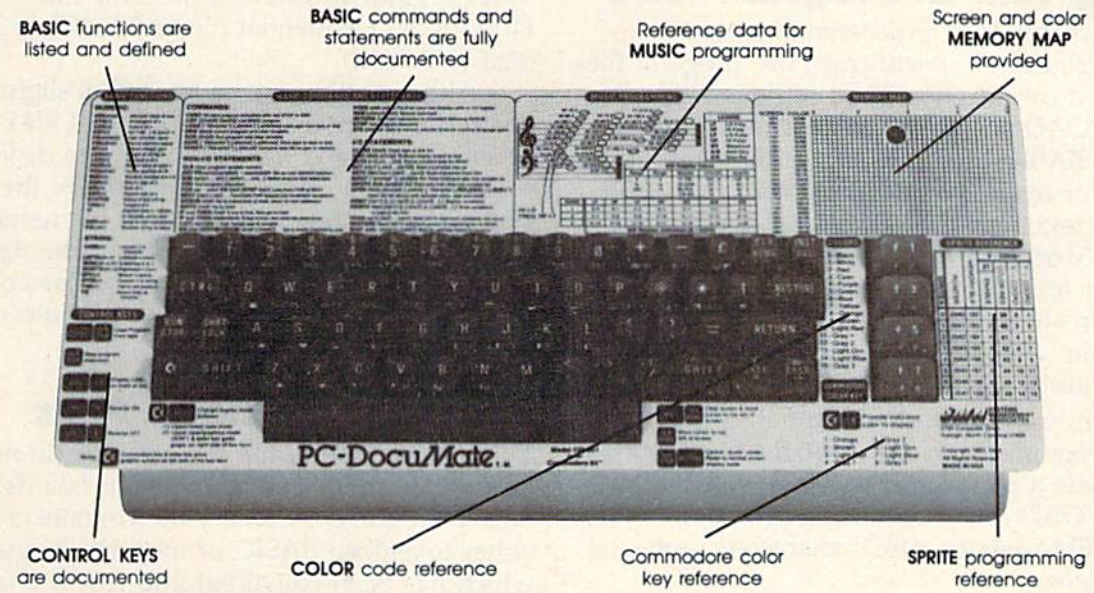
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I'm ready, that is, if my word processor were able to read the message file created by the terminal program.

Word processors usually store text either in sequential files or program files. In order to edit downloaded files (and to prepare text files for uploading), the terminal software and the word processor must read and write the same type of file.

If your terminal program and word processor use disk storage, check your word processor's documentation. If it doesn't tell you the file type, there's a simple (and easy) way to find out. Create a file using your word processor, and store it to disk. Then type NEW to clear BASIC memory, and load the disk directory (LOAD "$",8). LIST the directory and look to the right of the filename you created earlier. You will see PRG (program) or SEQ (sequential). That's the type of file your word processor uses.

If the word processor works with sequential files, you're in good shape, because all terminal programs with download capability will process sequential files.

Storing Text In Program Files

However, many word processors (including *WordPro 3 Plus* and SpeedScript) use program files because text can be stored and retrieved either with the LOAD and SAVE commands commonly used with BASIC programs, or the files can be OPENed for reading and writing as if they were sequential text files.

If the word processor generates program files, check your terminal software's documentation to see if it can store downloaded text as a program file. If it can, your terminal software and word processor probably are compatible.

Keep in mind that even if the disk file is called a program file, it still contains text. You cannot create a program file with a word processor, then LOAD and RUN it as a program, because the file contains ASCII characters, not BASIC tokens.

One other conversion snafu is possible. Some word processors use unique control characters for indentation, centering, and the like. These control characters make sense to the word processor, but they may mean something entirely different to the terminal program. Also, some word processors store text as screen codes rather than as ASCII characters. If your word processor and terminal program use the same file type but you're still having problems editing downloaded files, you may need a program which can convert the downloaded files from CBM ASCII into the screen codes and unique control characters which the word processor can read.

Downloading Files

Bulletin boards and networks maintain data bases, or access areas, where you will find three types of files: text (TXT), binary (BIN), and image (IMG) files.

The most common, and the type most often used by bulletin boards, is the text file. Here, as with disk program files containing text, the name is misleading. You might expect to find only words and sentences in a text file. Not so; some text files contain BASIC program listings. Less frequently, text files hold disassembled machine language listings.

If the file does contain text, it is downloaded and edited the same way as the Volkswagen repair tips were handled.

If a text file contains a program listing, however, you can't just download it and run it as is. It is not true BASIC, but rather a character-by-character ASCII representation of a BASIC listing. Before it can be loaded and run as a program, it must be converted from ASCII characters into tokenized BASIC form.

Your terminal software should include an auxiliary program which performs the conversion. This program will have a filename like FILE.PROG (sequential file to BASIC) or TXTBAS (text to BASIC).

Although the procedure differs slightly from one terminal to another, the general idea is to download the text file and store it to disk as a sequential file. Then LOAD and RUN the conversion program. You will be asked the name of the sequential file to be converted and the name of the BASIC program to be created. The conversion program will then translate the text into tokenized BASIC and store it on disk.

Binary And Image Files

The second type of file you will see (in network data bases rather than on bulletin boards) is the binary file (BIN). A binary file contains a program, either tokenized BASIC or machine language, which has been converted into ASCII characters. If you download a binary file, your screen will fill with a progression of lines beginning with a colon, followed by a series of numbers and letters like the hexadecimal numbers you see when you use a machine language monitor to display your computer's memory contents.

As with text files, binary files must be converted, and your software should include an ASCII-to-binary conversion program.

The third type of file is called an image file. Image files are downloaded in the same format as binary files. In fact, the only real difference between the two is that image files contain unique error-detection codes used by CompuServe, to

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Several small software houses have adopted CompuServe's image file formats for their own terminal programs. For the computer user, this provided a degree of standardization which was applauded when first introduced. The ovation was cut short by progress, however, when CompuServe changed its formats, and image files created or converted by other software were no longer compatible.

CompuServe attempted to clear up some of the ensuing mess by going through the files in its data bases and relabeling those now-obsolete image files as binary files. And the small software houses, for their part, began updating their programs to fit the new format.

Confusing Names And Formats

Some confusion still lingers, though. In the first place, many terminal programs still refer to binary files as image files in the sections of their documentation which deal with converting the files to binary form. And some terminal programs have been updated to convert according to the new format, while others still convert according to the old format.

In the best of all possible worlds, all this experimenting and detective work would be unnecessary. A user could buy a Brand X word processor and a Brand Y terminal program, and still get transparent conversions and file compatibility.

In the real world, the lack of standardization is not merely a matter of poor planning, or of hostility between hardware and software manufacturers. The patchwork of competing standards may be a source of frustration for home computer owners, but it's a source of profits for home computer manufacturers. Our economy is based on competition; trade secrets and unique formats give a company a competitive edge.

A Step Toward Integration

Competition makes universal compatibility an unlikely prospect. But as home telecomputing becomes more popular, we will certainly see the second-best possible world: integrated software. The CompuServe Information Service has moved in this direction by marketing a sophisticated terminal package, *Vidtex*, which is integrated with CompuServe's network software. This means that *Vidtex* and CompuServe's software can interact transparently, providing such advanced features as error-free file transfers and automatic transfer of data from CompuServe directly to your disk drive (and all you have to do is supply a filename).

Vidtex is available from CompuServe or from Commodore Business Machines for the Commodore 64, with both disk and tape versions. The price is $39.95. Unfortunately, there is no version for the VIC-20.

Terminal packages before *Vidtex* (and even some of its current competitors) were conglomerations, consisting of a terminal program supported by several auxiliary programs which were used off-line to convert files. *Vidtex* makes it possible to perform most conversion and storage tasks on-line automatically, using a single program.

Using two sets of special-function keys, a user can download and store a file without logging off or losing any transmission from the host. You can interrupt an on-line session anytime to check the disk directory or to perform such disk housekeeping tasks as scratching files, copying files, or converting them from one form to another.

Before *Vidtex*, functions like these required extensive involvement of the user, and extensive technical knowledge. If a user wanted to download several files, for example, he would have to log off and convert each file as it was downloaded, then log back on and repeat the process.

Automatic Telecomputing

Vidtex has an autofile feature that allows the user to instruct the program to dial the host computer, log on, go directly to a data base, download one or more files, store them to disk, and log off. After setting up the autofile, all the user has to do to intitate this process is hold down the Commodore key and press J.

Vidtex will convert files to standard ASCII or CBM ASCII as they are transferred to disk. It also allows a user to choose whether data will be stored in a sequential or a program file.

If you are not already familiar with a terminal program, and your technical skills don't include a thorough grounding in file conversion, your safest bet is to use *Vidtex* to download binary or image files from CompuServe's data bases.

With *Vidtex*, most of the confusion will evaporate, and you'll also get color, graphics, and other special features made possible by the integrated relationship between *Vidtex* and CompuServe.

The only real shortcoming of this software is the lack of an off-line word processor which would create and edit text files for uploading and downloading.

CompuServe has a good business reason for not including such a word processor in the package; the network offers text editors and word processors as part of its on-line service. If the company included a word processor on the disk

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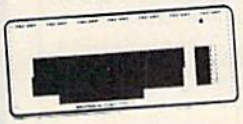

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O.K. So now you've got the best computer in the world, and lots of complex software to run on it. One problem. Unless you work with some of these programs everyday or are a computer genius, who can keep all those commands straight? "F5" in one program means one thing, and "F5" in another program means something else.

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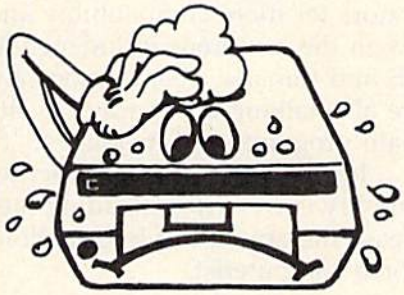

Most of them are, you know. Commodore makes a great disk drive. Only trouble is, they suffer from read and write problems frequently. And almost always, it means a trip to the shop for a head alignment. Maybe you can afford to have your drive out of commission for a while. And to pay to have your drive repaired. But we've been told that most of these problems occur because the drive has overheated, throwing the head out of alignment because of parts expansion.

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with *Vidtex*, you wouldn't need to pay $6 an hour to use the on-line word processors.

Integrated Bulletin Boards

The same level of integration and sophistication is just around the corner for bulletin board users.

There is a strong probability that by the end of 1984 we'll see telecommunications packages which include a fully compatible bulletin board system (BBS), terminal program, and word processor, all produced by the same company.

There is growing support among BBS operators for more compatibility and cooperation between the hundreds of independent boards in the US and Canada. Board sysops (system operators) are also talking about ways to share public domain programs and messages.

Ideally, all of these factors will combine to simplify current downloading methods and to increase the amount of information available to the home computerist.

If you have questions or ideas about subjects you'd like to see covered in this column, write to: Home Telecommunications, COMPUTE!'s GAZETTE, *P.O. Box 5406, Greensboro, NC 27403. Or you can send me electronic mail. My CompuServe ID is 75005, 1553. For Delphi, it's BOZART.*

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Dan Carmichael, Assistant Editor

In looking at a lot of home-brewed programs, I've seen many good, original ideas. However, the best programs are sometimes hindered by bad screen displays and/or poor screen and color usage.

Some programmers use only one quarter of the available screen, while others have the screen so cluttered you can't make heads from tails.

This month, let's talk about some ideas on screen and color usage. With an appealing screen and good colors, you can make your programs attractive and pleasant to use for even a first-time computer user.

Screen Usage

An organized screen adds a lot to a program. When the screen display is neatly presented, the program becomes much easier to use. If the screen display is confusing, the user is more than likely to also become confused.

Use the entire screen if possible. Don't try to place all the information into one area. For example, organize your screen displays into neatly drawn rows and columns. When working with large amounts of data (such as in a data base), scanning rows and columns then becomes easier and less tiring for the user.

If at all possible, don't place too much information on the screen at the same time. Double-space your display when possible. It's much easier on the eye. When the user looks at a readable screen, there's much less chance of error.

Colors

Colors can be very important. Besides their aesthetic value, they can help make programs appealing.

The VIC-20 has eight colors available, so use them to their best advantage. For example, in financial applications, color combinations can instantly signal to the user the status of an account. Using red to display deficits and green to display credits is already standard procedure. Beyond that, you might include yellow for recent payments, black for overdue payments, etc.

However, there are cautions. When writing programs for a wide range of users, you might assume too much. What if the program is being run on a computer with a black and white monitor? Reds and greens (as in the above example) can appear to be the same gray on a black-and-white screen.

I've seen many programs that place red print on top of a blue background. Red and blue tend to offset each other and look nice. However, on a black-and-white monitor, these colors look the same—the print can't be seen. The best way to view your program as others may see it is to turn down the color level on your monitor. This will allow you to preview the program in both color and black and white.

Cursor Controls

The cursor control characters on your VIC can be very powerful tools. Using them in PRINT statements will allow you to move anywhere on the screen without altering the screen display. This program demonstrates some of the uses of the cursor controls:

```
20 PRINT"{CLR}{BLU} NAME"TAB(18)"{RED}AGE
   "                                :rem 196
30 PRINT"{8 DOWN}{PUR} COLOR"TAB(17)"
   {GRN}YEAR"                       :rem 250
35 REM THE FOLLOWING LINE REQUIRES A SHIF
   TED ASTERISK                      :rem 36
40 PRINT"{2 DOWN}{BLU}**************************
   ***"                              :rem 246
50 GOSUB 1000                       :rem 166
55 PRINT"{BLK}WHAT'S YOUR FIRST NAME"
                                    :rem 113
60 INPUT NA$                        :rem 169
70 PRINT"{HOME}{DOWN} "NA$           :rem 15
80 GOSUB1000                        :rem 169
90 GOSUB1000                        :rem 170
100 PRINT"WHAT'S YOUR AGE"           :rem 44
110 INPUT AG                        :rem 170
120 PRINT"{HOME}{DOWN}"TAB(17)AG    :rem 160
130 GOSUB1000                       :rem 213
140 PRINT"WHAT'S YOUR FAVORITE{2 SPACES}C
    OLOR"                            :rem 66
150 INPUT CO$                       :rem 220
160 PRINT"{HOME}{10 DOWN} "CO$      :rem 219
170 GOSUB1000                       :rem 217
180 PRINT"WHAT YEAR WERE YOU":PRINT"
    {3 UP}BORN"                     :rem 238
190 INPUT YR                        :rem 213
200 PRINT"{HOME}{10 DOWN}";TAB(16)YR
                                    :rem 149
210 GOSUB1000                       :rem 212
220 PRINT"REPEAT QUIZ?":PRINT"{2 UP}(TYPE
     Y OR N)"                       :rem 182
230 INPUT AN$:IFAN$="N"THENGOSUB1000:PRIN
    T"PROGRAM ENDED":END             :rem 39
240 GOTO20                           :rem 49
999 END                             :rem 130
1000 PRINT"{HOME}{13 DOWN}"         :rem 130
1010 PRINT"{66 SPACES}"             :rem 147
```

```
1020 PRINT"{UP}{44 SPACES}"          :rem 37
1030 PRINT"{8 UP}":RETURN            :rem 55
```

The program is a simple little quiz that asks for your name, age, favorite color, and the year you were born. It splits the screen, using the top half to display the input information, and the bottom for the user prompts.

Lines 20–40 print the top half of the screen. The cursor is then dropped down to the prompt window, and the first question is displayed. After the question is answered, the cursor is moved to the home (top left corner) position on the screen. This is done with the home (cursor) character. The cursor is then moved to the proper display position (in line 70), and the user's name is printed.

After printing the information, the program goes to the subroutine at line 1000. This simply clears the user prompt area and makes it ready to display the next question. It does this by first moving the cursor to the home position. Then the cursor is moved down 13 lines, and spaces are printed in the prompt window. The spaces are printed over the last prompt, erasing it. The cursor is then moved up a few lines, the next question is displayed, and the whole cycle starts over again.

When using the cursor extensively, it's best to start each print operation at one reference point. The home position is easiest because the cursor can be moved there with one PRINT statement: PRINT "{home}".

Machine Language And Screen Usage

Machine language can be a useful tool when organizing screen displays. Using machine language to move the cursor is easy because your VIC has a built-in (cursor) *plot* routine.

Following is a routine that you can incorporate into your own programs. With two POKEs and a SYS, it will position the cursor anywhere on the screen. The program is a BASIC loader, and will POKE the machine language program into the cassette buffer.

```
10 FORA=885TO892:READB:POKEA,B:NEXT
20 DATA 24,166,251,164,252,76,240,255
```

To use the program, first POKE the column number (0–21) you wish to move the cursor to into memory location 251, e.g., POKE 251,10. Next POKE the row number (0–22) into 252, e.g., POKE 252,10. And then SYS885 to move the cursor to that position and PRINT the desired data. A sample line might look like this:

```
30 POKE 251,10:POKE 252,10:SYS 885: PRINT "ABC"
```

By effectively organizing and coloring your screen displays, you can give your programs a professional look.

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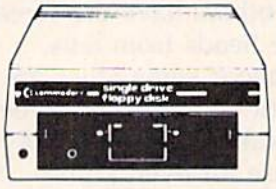

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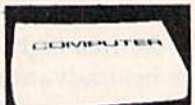

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Rescuing Programs From Tape Load Errors

Alan M. Wilson

If you've discovered a clever timesaving technique or a brief but effective programming shortcut, send it to "Hints & Tips," c/o COMPUTE!'s GAZETTE. *If we use it, we'll pay you $35. Due to the volume of items submitted, we regret that we cannot always reply individually to submissions.*

Saving programs on tape is usually very reliable. But at some point, you will encounter the frustrating ?LOAD ERROR.

If it were a simple matter of syntax, you could find the line in the program and fix it. But you don't even have a program; it was lost in the netherworld between the tape and the computer. What can you do?

First Aid

The first thing you can do is try again. If this works, you can forget about the more drastic measures. If you had been working on a program, especially one with a lot of POKEs, you should first turn the computer off and then on again. Certain memory locations are used as pointers, registers, and buffers in tape loads and you may have scrambled them with an accidental POKE.

You should also remember that the program has to be translated into electrical signals which travel through the connecting cable. Magnetic fields from your television or power supply could be getting in the way. It sometimes helps to move your Datassette to a new location, away from these sources of interference.

If you are getting load errors from programs which used to be fine, the fault may lie in your cassette player. After hours of use, the tape heads can get dirty or magnetized. You can buy inexpensive cleaning/demagnetizing kits at electronics or record stores. It's a good practice to clean the heads periodically.

There is one more possibility. If the problem is not the computer, the cable, or the tape head, it may be the tape.

If the tape is defective or the program was recorded wrong, there may still be an answer to your problem.

The Pros And Cons Of Redundancy

You may not know it, but Commodore did you a favor when they designed their cassette storage system. When you SAVE a program, three sections are written to tape. The first is the tape header, with the name of the program and some other information. The second is the program. The third is the program (again).

When a program is LOADed, the header goes into the cassette buffer, the first copy of the program goes into memory, and the second copy is then checked against what is in memory. If they match, the BASIC pointers to the end of memory are set and the program is ready to run. If the two programs (which should be identical twins) don't match, you get a ?LOAD ERROR. It is more than a simple checksum, it is complete redundancy.

One disadvantage of redundancy is that it doubles the time needed to load and save. Another disadvantage is that you can't get to the program if the first copy is perfect and the second is flawed.

The one benefit of saving twice is obvious. Redundancy makes using tape very reliable.

We have the first clue to solving our problem: The program is in memory (though it didn't look exactly like its twin). If you PEEK the first few locations of BASIC memory, you will see the line link, line number, and tokenized program.

Now we have to reset the end-of-program pointers.

The first five bytes of the tape header contain some important information. The first indicates what type of tape file it is (program or data). The starting address is found in bytes two and three, the ending address in four and five. Since the header has been put into the cassette buffer, which begins at 828, we have our second clue. The end-of-program pointer is in locations 831–832.

If you have run into a ?LOAD ERROR, try entering this line (in immediate mode, without a line number):

```
FORX=45TO49STEP2: POKEX,PEEK(831):
  POKEX+1,PEEK(832): NEXT
```

The pointers are reset and the program has been rescued (maybe).

A Few Warnings

If you get a ?LOAD ERROR, do not try to LIST the program. The computer will put two zeros where it thinks the program ends. You'll lose your first line link.

You can do the POKEs listed above before you try LOADing again, but the method does not always work. It will rescue the first copy of the tape program. If the first copy is flawed, you'll get a flawed program. After the POKEs, you can LIST the program. If it looks OK, you should SAVE it immediately (and use a different tape, in case there's a flaw in the one in the Datassette).

This method is pretty reliable, and can save a program you thought was lost.

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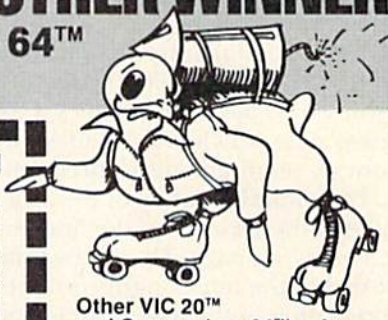

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COMPUTE!'s Gazette for Commodore

AUTHOR GUIDE

COMPUTE!'s Gazette for Commodore is looking for interesting, useful articles aimed at beginning to intermediate VIC-20 and Commodore 64 users. If you have an article idea or a good original program, we'd like to see it. Don't worry if you are not a professional writer. We are more concerned with the content of an article than its style. Simply try to be clear in your writing and check your program for any bugs.

COMPUTE!'s Gazette for Commodore is a consumer-oriented magazine for VIC-20 and Commodore 64 users who want to get the most out of their computers in a non-technical way. It is aimed primarily at home users, not all of whom necessarily want to become expert programmers. If your article covers a more advanced or technical topic, you may choose to submit it to our companion publication, **COMPUTE!**. If you submit an article to one of our magazines and we believe it would be more suitable to the other, we will transfer your submission to the right editors. The basic editorial requirements for publication are the same for both magazines; so are the payment rates.

The following guidelines will permit your good ideas and programs to be more easily edited and published. Most of these suggestions serve to improve the speed and accuracy of publication:

1. The upper left corner of the first page should contain your name, address, telephone number, and the date of submission.

2. The following information should appear in the upper right corner of the first page. If your article is specifically directed to either the VIC-20 or Commodore 64, please state which one. In addition, please indicate the memory requirements of programs.

3. The underlined title of the article should start about 2/3 of the way down the first page.

4. Following pages should be typed normally, except that in the upper right corner there should be an abbreviation of the title, your last name, and the page number. For example: Memory Map/Smith/2.

5. Short programs (under 20 lines) can easily be included within the text. Longer programs should be separate listings. *It is essential that we have a copy of the program, recorded twice, on a tape or disk.* The tape or disk should be labeled with your name and the title of the article. Tapes are fairly sturdy, but disks need to be enclosed within plastic or cardboard mailers (available at photography, stationery, or computer supply stores).

It is far easier for others to type in your program if you use CHR$(X) values and TAB(X) or SPC(X) instead of cursor manipulations to format your output. For five carriage returns, FOR I = 1 TO 5:PRINT:NEXT is far more "portable" to other computers with other BASICs and also easier to type in. And, instead of a dozen right-cursor symbols, why not simply use PRINT SPC(12)? A quick check through your program – making these substitutions – would be greatly appreciated by your editors and by your readers.

6. If your article is accepted and you have since made improvements to the program, please submit an entirely new tape or disk and a new copy of the article reflecting the update. We cannot easily make revisions to programs and articles. It is necessary that you send the revised version as if it were a new submission entirely, but be sure to indicate that your submission is a revised version by writing "Revision" on the envelope and the article.

7. All lines within the text of the article should be spaced so that there is about 1/2 inch between them. A one-inch margin should be left at the right, left, top, and bottom of each page. No hyphens should be used at the ends of lines to break words. And please do not justify. Leave the lines ragged.

8. Standard typing paper should be used (no onionskin or other thin paper) and typing should be on one side of the paper only (upper- and lowercase).

9. Sheets should be attached together with a paper clip. Staples should not be used.

10. A good general rule is to spell out the numbers zero through ten in your article and write higher numbers as numerals (1024). The exceptions to this are: Figure 5, Table 3, TAB(4), etc. Within ordinary text, however, the zero through ten should appear as words, not numbers. Also, symbols and abbreviations should not be used within text: use "and" (not &), "reference" (not ref.), "through" (not thru).

11. For greater clarity, use all capitals when referring to keys (RETURN, TAB, ESC, SHIFT), BASIC words (LIST, RND, GOTO), and three languages (BASIC, APL, PILOT). Headlines and subheads should, however, be initial caps only, and emphasized words are not capitalized. If you wish to emphasize, underline the word and it will be italicized during typesetting.

12. *COMPUTE!'s Gazette* for Commodore pays between $75 and $1000 for published articles. In general, the rate reflects the length and quality of the article. Payment is made upon acceptance of an article. Following submission (Editorial Department, *COMPUTE!'s Gazette* for Commodore, P.O. Box 5406, Greensboro, NC 27403) it will take from four to six weeks for us to reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. Rejected manuscripts are returned to authors who enclose an SASE. We do not consider articles which are multiple submissions. If you wish to send an article to another magazine for consideration, please do not submit it to us.

13. Articles can be of any length – from a single-line routine to a multi-issue series. The average article is about four to eight double-spaced, typed pages.

14. If you want to include photographs, they should be 5x7, black-and-white glossies.

NEWS & PRODUCTS

Data Base For 64

Superbase 64 is a data base management and information retrieval system for the Commodore 64 computer, produced by Precision Software, Inc.

The package offers an unlimited number of data bases, with up to 15 files per data base. The number of records per file is restricted only by disk drive capacity. Each record can hold up to 1,108 characters with a maximum of 127 fields.

The system includes search and sort capabilities, and customized applications can be created within the *Superbase 64* environment. The package runs with a 1541 disk drive, or any larger Commodore drive, including a hard disk.

Superbase 64 is available for $99.

Precision Software, Inc.
Suite 1100
820 Second Avenue
New York, NY 10017
(212) 490-1825

VIC Gaming Aid

Reilly Associates has announced the release of *Fantasy Character Generator*, a programmed gaming aid for the VIC-20 computer.

The package is designed to assist the game moderator in fantasy role-playing games by generating any number of characters for a campaign. Among the features are 9 character classes, 8 character races, 13 primary statistics, personal characteristics, listing of possessions, and a number of other character statistics.

Fantasy Character Generator requires an 8K or 16K memory expander, and is available for $8.95 (add $1 for shipping and handling).

Reilly Associates
P.O. Box 17144
Rochester, NY 14617

64 Accounting Package

Clockwork Computers, Inc., has introduced the *CCI Bottom Liner*, a personal and small business accounting system for the 64 which requires a 1541 disk drive and printer.

A detail ledger file includes automatic numbering for a complete audit trail. There is also an annotation area for transaction explanations. The ledger file is linked to the accounts, client, and projects files.

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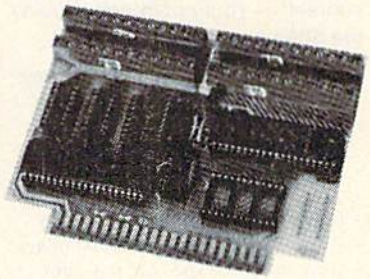

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Clockwork Computers, Inc.
4612 Holly Ridge Road
Rockville, MD 20853
(301) 924-5509

COMPUTE!'s GAZETTE *welcomes announcements of new products for VIC-20 and Commodore 64 computers, especially products aimed at beginning to intermediate users. Please send press releases and photos well in advance to: Tony Roberts, Assistant Managing Editor,* COMPUTE!'s GAZETTE, *P.O. Box 5406, Greensboro, NC 27403.*

New product releases are selected from submissions for reasons of timeliness, available space, and general interest to our readers. We regret that we are unable to select all new product submissions for publication. Readers should be aware that we present here some edited version of material submitted by vendors and are unable to vouch for its accuracy at time of publication.

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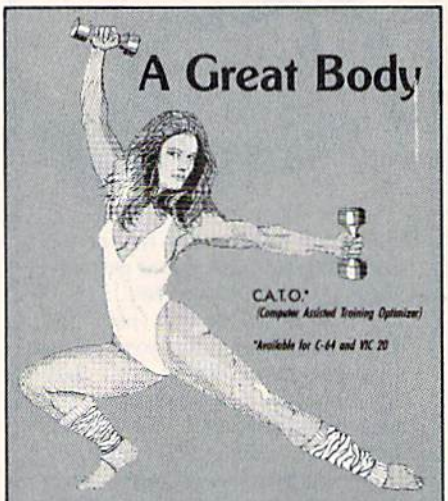

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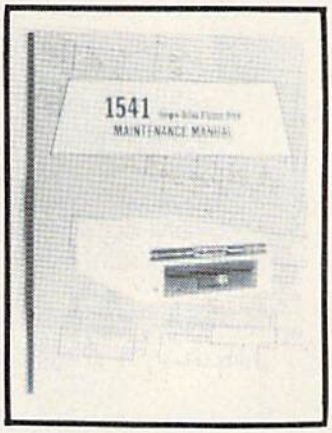
How to do your own maintenance, troubleshooting, schematics, theory of operation, cleaning hints, conversion from one power source to another and calibration. These topics and many more will make this manual a valued addition to your reference shelf. Whether you are an amateur electronics technician or a seasoned professional, you will be able to realize the full potential of your VIC-1541 by using this manual. Step-by-step instructions will lead you through the proper methods to get your VIC-1541 up and going in a hurry. The manual is 170 pages long, has two foldouts and over 100 illustrations, including:



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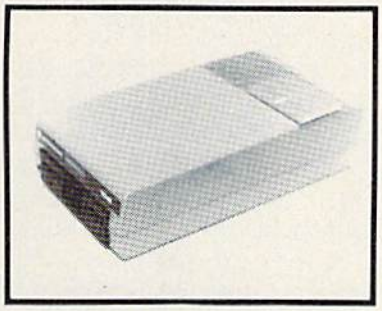

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A Beginner's Guide To Typing In Programs

What Is A Program?

A computer cannot perform any task by itself. Like a car without gas, a computer has *potential*, but without a program, it isn't going anywhere. Most of the programs published in COMPUTE!'s GAZETTE for Commodore are written in a computer language called BASIC. BASIC is easy to learn and is built into all VIC-20s and Commodore 64s.

BASIC Programs

Each month, COMPUTE!'s GAZETTE for Commodore publishes programs for both the VIC and 64. To start out, type in only programs written for your machine, e.g., "VIC Version" if you have a VIC-20. Later, when you gain experience with your computer's BASIC, you can try typing in and converting certain programs from another computer to yours.

Computers can be picky. Unlike the English language, which is full of ambiguities, BASIC usually has only one "right way" of stating something. Every letter, character, or number is significant. A common mistake is substituting a letter such as O for the numeral 0, a lowercase l for the numeral 1, or an uppercase B for the numeral 8. Also, you must enter all punctuation such as colons and commas just as they appear in the magazine. Spacing can be important. To be safe, type in the listings *exactly* as they appear.

Braces And Special Characters

The exception to this typing rule is when you see the braces, such as "{DOWN}". Anything within a set of braces is a special character or characters that cannot easily be listed on a printer. When you come across such a special statement, refer to "How To Type In *COMPUTE!'s GAZETTE* Programs."

About DATA Statements

Some programs contain a section or sections of DATA statements. These lines provide information needed by the program. Some DATA statements contain actual programs (called machine language); others contain graphics codes. These lines are especially sensitive to errors.

If a single number in any one DATA statement is mistyped, your machine could "lock up," or "crash." The keyboard and STOP key may seem "dead," and the screen may go blank. Don't panic – no damage is done. To regain control, you have to turn off your computer, then turn it back on. This will erase whatever program was in memory, *so always SAVE a copy of your program before you RUN it.* If your computer crashes, you can LOAD the program and look for your mistake.

Sometimes a mistyped DATA statement will cause an error message when the program is RUN. The error message may refer to the program line that READs the data. *The error is still in the DATA statements, though.*

Get To Know Your Machine

You should familiarize yourself with your computer before attempting to type in a program. Learn the statements you use to store and retrieve programs from tape or disk. You'll want to save a copy of your program, so that you won't have to type it in every time you want to use it. Learn to use your machine's editing functions. How do you change a line if you made a mistake? You can

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always retype the line, but you at least need to know how to backspace. Do you know how to enter inverse video, lowercase, and control characters? It's all explained in your computer's manuals.

A Quick Review

1. Type in the program a line at a time, in order. Press RETURN at the end of each line. Use backspace or the back arrow to correct mistakes.

2. Check the line you've typed against the line in the magazine. You can check the entire program again if you get an error when you RUN the program.

3. Make sure you've entered statements in braces as the appropriate control key (see "How To Type *COMPUTE!'s GAZETTE* Programs" elsewhere in the magazine).

We regret that we are not able to respond to individual inquiries about programs, products, or services appearing in COMPUTE!'s GAZETTE *for Commodore due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear in the magazine, usually within eight weeks. If you have specific questions about items or programs which you've seen in* COMPUTE!'s GAZETTE *for Commodore, please send them to Gazette Feedback, P.O. Box 5406, Greensboro, NC 27403.*

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How To Type In COMPUTE!'s GAZETTE Programs

Many of the programs which are listed in COMPUTE!'s GAZETTE contain special control characters (cursor control, color keys, inverse video, etc.). To make it easy to know exactly what to type when entering one of these programs into your computer, we have established the following listing conventions.

Generally, any VIC-20 or Commodore 64 program listings will contain words within braces which spell out any special characters: {DOWN} would mean to press the cursor down key. {5 SPACES} would mean to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key would be underlined in our listings. For example, S would mean to type the S key while holding the shift key. This would appear on your screen as a "heart" symbol. If you find an underlined key enclosed in braces (e.g., {10 N}), you should type the key as many times as indicated (in our example, you would enter ten shifted N's).

If a key is enclosed in special brackets, [ ], you should hold down the *Commodore key* while pressing the key inside the special brackets. (The Commodore key is the key in the lower left corner of the keyboard.) Again, if the key is preceded by a number, you should press the key as many times as necessary.

Rarely, you'll see a solitary letter of the alphabet enclosed in braces. These characters can be entered on the Commodore 64 by holding down the CTRL key while typing the letter in the braces. For example, {A} would indicate that you should press CTRL-A. You should never have to enter such a character on the VIC-20, but if you do, you would have to leave the quote mode (press RETURN and cursor back up to the position where the control character should go), press CTRL-9 (RVS ON), the letter in braces, and then CTRL-0 (RVS OFF).

About the *quote mode*: You know that you can move the cursor around the screen with the CRSR keys. Sometimes a programmer will want to move the cursor under program control. That's why you see all the {LEFT}'s, {HOME}'s, and {BLU}'s in our programs. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote (the double quote, SHIFT-2), you are in the quote mode. If you type something and then try to change it by moving the cursor left, you'll only get a bunch of reverse-video lines. These are the symbols for cursor left. The only editing key that isn't programmable is the DEL key; you can still use DEL to back up and edit the line. Once you type another quote, you are out of quote mode.

You also go into quote mode when you INSerT spaces into a line. In any case, the easiest way to get out of quote mode is to just press RETURN. You'll then be out of quote mode and you can cursor up to the mistyped line and fix it.

Use the following table when entering cursor and color control keys:

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + CRSR ↑	
{DOWN}	CRSR ↓	
{LEFT}	SHIFT + CRSR →	
{RIGHT}	CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
[1]	C= + 1	
[2]	C= + 2	
[3]	C= + 3	
[4]	C= + 4	
[5]	C= + 5	
[6]	C= + 6	
[7]	C= + 7	
[8]	C= + 8	
{F1}	f1	
{F2}	SHIFT + f1	
{F3}	f3	
{F4}	SHIFT + f3	
{F5}	f5	
{F6}	SHIFT + f5	
{F7}	f7	
{F8}	SHIFT + f7	

MLX Machine Language Entry Program

For Commodore 64 And VIC-20

Charles Brannon, Program Editor

MLX is a labor-saving utility that allows almost failsafe entry of machine language programs published in COMPUTE!'s GAZETTE. You need to know nothing about machine language to use MLX—it was designed for everyone. There are separate versions for the Commodore 64 and expanded VIC-20 (at least 8K).

MLX is a new way to enter long machine language (ML) programs with a minimum of fuss. MLX lets you enter the numbers from a special list that looks similar to BASIC DATA statements. It checks your typing on a line-by-line basis. It won't let you enter illegal characters when you should be typing numbers. It won't let you enter numbers greater than 255 (forbidden in ML). It won't let you enter the wrong numbers on the wrong line. In addition, MLX creates a ready-to-use tape or disk file. You can then use the LOAD command to read the program into the computer, as with any program:

```
LOAD"filename",1,1   (for tape)
LOAD"filename",8,1   (for disk)
```

To start the program, you enter a SYS command that transfers control from BASIC to machine language. The starting SYS number always appears in the appropriate article.

Using MLX

Type in and save the correct version of MLX for your computer (you'll want to use it in the future). When you're ready to type in an ML program, run MLX. MLX asks you for two numbers: the starting address and the ending address. These numbers are given in the article accompanying the ML program.

You'll see a prompt corresponding to the starting address. The prompt is the current line you are entering from the listing. It increases by six each time you enter a line. That's because each line has seven numbers—six actual data numbers plus a *checksum number*. The checksum verifies that you typed the previous six numbers correctly. If you enter any of the six numbers wrong, or enter the checksum wrong, the computer rings a buzzer and prompts you to reenter the line. If you enter it correctly, a bell tone sounds and you continue to the next line.

MLX accepts only numbers as input. If you make a typing error, press the INST/DEL key; the entire number is deleted. You can press it as many times as necessary back to the start of the line. If you enter three-digit numbers as listed, the computer automatically prints the comma and goes on to accept the next number. If you enter less than three digits, you can press either the comma, SPACE bar, or RETURN key to advance to the next number. The checksum automatically appears in inverse video for emphasis.

To simplify your typing, MLX redefines part of the keyboard as a numeric keypad (lines 581–584):

```
    U  I  O                7  8  9
H   J  K  L   become   0    4  5  6
    M  ,  .                1  2  3
```

MLX Commands

When you finish typing an ML listing (assuming you type it all in one session) you can then save the completed program on tape or disk. Follow the screen instructions. If you get any errors while saving, you probably have a bad disk, or the disk is full, or you've made a typo when entering the MLX program itself.

You don't have to enter the whole ML program in one sitting. MLX lets you enter as much as you want, save it, and then reload the file from tape or disk later.

MLX recognizes these commands:

SHIFT-S: Save	**SHIFT-N: New Address**
SHIFT-L: Load	**SHIFT-D: Display**

When you enter a command, MLX jumps out of the line you've been typing, so we recommend you do it at a new prompt. Use the Save command to save what you've been working on. It will save on tape or disk as if you've finished, but the tape or disk won't work, of course, until you finish the typing. Remember what address you stop at. The next time you run MLX, answer all the prompts as you did before, then insert the disk or tape. When you get to the entry prompt, press SHIFT-L to reload the partly completed file into memory. Then use the New Address command to resume typing.

To use the New Address command, press SHIFT-N and enter the address where you previously stopped. The prompt will change, and you can then continue typing. Always enter a New Address that matches up with one of the line numbers in the special listing, or else the checksum won't work. The Display command lets you display a section of your typing. After you press SHIFT-D, enter two addresses within the line number range of the listing. You can abort the listing by pressing any key.

What if you forgot where you stopped typing? Use the Display command to scan memory from the beginning to the end of the program. When you reach the end of your typing, the lines will contain a random pattern of numbers. When you see the end of your typing, press any key to stop the listing. Use the New Address command to continue typing from the proper location.

See program listing on page 134.

The Automatic Proofreader

"The Automatic Proofreader" will help you type in program listings from COMPUTE!'s Gazette without typing mistakes. It is a short error-checking program that hides itself in memory. When activated, it lets you know immediately after typing a line from a program listing if you have made a mistake. Please read these instructions carefully before typing any programs in COMPUTE!'s Gazette.

Preparing The Proofreader

1. Using the listing below, type in the Proofreader. The same program works on both the VIC-20 and Commodore 64. Be very careful when entering the DATA statements — don't type an l instead of a 1, an O instead of a 0, extra commas, etc.

2. SAVE the Proofreader on tape or disk at least twice *before running it for the first time*. This is very important because the Proofreader erases this part of itself when you first type RUN.

3. After the Proofreader is SAVEd, type RUN. It will check itself for typing errors in the DATA statements and warn you if there's a mistake. Correct any errors and SAVE the corrected version. Keep a copy in a safe place — you'll need it again and again, every time you enter a program from COMPUTE!'s Gazette.

4. When a correct version of the Proofreader is RUN, it activates itself. You are now ready to enter a program listing. If you press RUN/STOP-RESTORE, the Proofreader is disabled. To reactivate it, just type the command SYS 886 and press RETURN.

Using The Proofreader

All VIC and 64 listings in COMPUTE!'s Gazette now have a *checksum number* appended to the end of each line, for example ":rem 123". *Don't enter this statement when typing in a program.* It is just for your information. The rem makes the number harmless if someone does type it in. It will, however, use up memory if you enter it, and it will confuse the Proofreader, even if you entered the rest of the line correctly.

When you type in a line from a program listing and press RETURN, the Proofreader displays a number at the top of your screen. *This checksum number must match the checksum number in the printed listing.* If it doesn't, it means you typed the line differently than the way it is listed. Immediately recheck your typing. Remember, don't type the rem statement with the checksum number; it is published only so you can check it against the number which appears on your screen.

The Proofreader is not picky with spaces. It will not notice extra spaces or missing ones. This is for your convenience, since spacing is generally not important. But occasionally proper spacing *is* important, so be extra careful with spaces, since the Proofreader will catch practically everything else that can go wrong.

There's another thing to watch out for: if you enter the line by using abbreviations for commands, the checksum will not match up. But there is a way to make the Proofreader check it. After entering the line, LIST it. This eliminates the abbreviations. Then move the cursor up to the line and press RETURN. It should now match the checksum. You can check whole groups of lines this way.

Special Tape SAVE Instructions

When you're done typing a listing, you must disable the Proofreader before SAVEing the program on tape. Disable the Proofreader by pressing RUN/STOP-RESTORE (hold down the RUN/STOP key and sharply hit the RESTORE key). This procedure is not necessary for disk SAVEs, *but you must disable the Proofreader this way before a tape SAVE.*

SAVE to tape erases the Proofreader from memory, so you'll have to LOAD and RUN it again if you want to type another listing. SAVE to disk does not erase the Proofreader.

Replace Original Proofreader

If you typed in the original version of the Proofreader (October 1983 issue), you should replace it with the improved version below. We added a POKE to the original version to protect it from being erased when you LOAD another program from tape. The POKE does protect the Proofreader, and the Proofreader itself was not affected. However, a quirk in the VIC-20's operating system means that programs typed in with the Proofreader and SAVEd on tape cannot be LOADed properly later. If you LOAD a program SAVEd while the Proofreader was in memory, you see ?LOAD ERROR. This applies only to VIC tape SAVEs (disk SAVEs work OK, and the quirk was fixed in the Commodore 64).

If you have a program typed in with the original Proofreader and SAVEd on tape, follow this special LOAD procedure:

1. Turn the power off, then on.
2. LOAD the program from tape (disregard the ?LOAD ERROR).
3. Enter: POKE 45,PEEK(174):POKE 46,PEEK(175):CLR
4. ReSAVE the program to tape.

The program will LOAD fine in the future. We strongly recommend that you type in the new version of the Proofreader and discard the old one.

Automatic Proofreader For VIC And 64

```
100 PRINT"{CLR}PLEASE WAIT...":FORI=886TO
    1018:READA:CK=CK+A:POKEI,A:NEXT
110 IF CK<>17539 THEN PRINT"{DOWN}YOU MAD
    E AN ERROR":PRINT"IN DATA STATEMENTS.
    ":END
120 SYS886:PRINT"{CLR}{2 DOWN}PROOFREADER
     ACTIVATED.":NEW
886 DATA 173,036,003,201,150,208
892 DATA 001,096,141,151,003,173
898 DATA 037,003,141,152,003,169
904 DATA 150,141,036,003,169,003
910 DATA 141,037,003,169,000,133
916 DATA 254,096,032,087,241,133
922 DATA 251,134,252,132,253,008
928 DATA 201,013,240,017,201,032
934 DATA 240,005,024,101,254,133
940 DATA 254,165,251,166,252,164
946 DATA 253,040,096,169,013,032
952 DATA 210,255,165,214,141,251
958 DATA 003,206,251,003,169,000
964 DATA 133,216,169,019,032,210
970 DATA 255,169,018,032,210,255
976 DATA 169,058,032,210,255,166
982 DATA 254,169,000,133,254,172
988 DATA 151,003,192,087,208,006
994 DATA 032,205,189,076,235,003
1000 DATA 032,205,221,169,032,032
1006 DATA 210,255,032,210,255,173
1012 DATA 251,003,133,214,076,173
1018 DATA 003
```

Bug-Swatter:
Modifications And Corrections

• The VIC version of "Cassette Beeper" (May) is missing a comma in line 75. The first two numbers in this DATA statement (169, −1141) should be changed to 169, −1, 141. Users of the 64 version have reported that Cassette Beeper works as listed when a program is loaded normally, but not when SHIFT-RUN/STOP (combination LOAD and RUN) is pressed.

• Some readers who own a VIC and a Datassette have reported that they cannot print documents created by "SpeedScript" (January). This is not a bug in SpeedScript, but rather a problem with the cassette drive grabbing (and holding onto) the serial bus. It is an inherent hardware bug. Commodore has suggested that after loading a program, VIC users enter SYS64490 before running it. This frees up the serial bus. The problem will continue to occur each time a tape save or load is executed.

• The next-page command [n] in SpeedScript does not work. It leads to an endless loop of form feeds. Reader Robin Franzel has disassembled and flowcharted the 64 version and has discovered a possible fix. After loading, but before running the 64 version, POKE 5755,133 seems to fix the next-page function. A word of caution: Theoretically, this POKE may affect some other embedded commands, causing the cursor to skip over the next character after the command.

In testing, however, everything worked fine. Readers who received SpeedScript as a bonus in the May GAZETTE DISK should not attempt this POKE; the next-page command works in this version.

• In addition, several readers have reported that when first trying to print a SpeedScript document, a line of seemingly random characters appears on the paper, followed by the regular text. This problem usually happens only the first time something is printed; subsequent printings are flawless.

In testing, we were unable to consistently duplicate the random characters. In hundreds of

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tests, it happened only a couple of times. The problem seems to be that the printer buffer (a small amount of RAM located either in the interface or the printer) contains some unwanted characters. Readers who have problems with random characters should try turning the printer off and then on or clearing the printer buffer with this line:

```
OPEN4,4:CMD4:PRINT:PRINT:CLOSE4
```

before running SpeedScript. Another method is to clear SpeedScript memory with the Erase All Text command (SHIFT-CLR/HOME) followed by a print (CTRL-P). The printer will execute a form feed and the buffer should be cleared. If the problem persists, another solution would be to leave some blank spaces at the top of the text, followed by a next-page command. The random characters will then appear on the first page, and succeeding pages will be printed normally.

● Some readers were uncertain about how to (and why) use the File Converter program in "SpeedScript Revisited" (May). When SpeedScript files are saved, they are stored as program files using screen codes (POKE numbers) rather than ASCII codes. Some word processors and most terminal programs use sequential files in ASCII format. Readers who use SpeedScript only for word processing will never need to convert their files. But if you want to upload and download files (using a modem) or if you want to use SpeedScript files with other word processing or spelling checker programs, File Converter allows you to switch back and forth between formats, extending the usefulness of SpeedScript. Converted files may require slight editing, depending on which control codes are used by the word processing or terminal program.

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MLX

See article on page 131.

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
10 REM LINES CHANGED FROM MLX VERSION 2.0
   0 ARE 750,765,770 AND 860       :rem 50
100 PRINT"{CLR}{6}";CHR$(142);CHR$(8);:
    POKE53281,1:POKE53280,1        :rem 67
101 POKE 788,52:REM DISABLE RUN/STOP
                                   :rem 119
110 PRINT"{RVS}{39 SPACES}";       :rem 176
120 PRINT"{RVS}{14 SPACES}{RIGHT}{OFF}
    {*}£{RVS}{RIGHT} {RIGHT}{2 SPACES}
    {*}┬{OFF}{*}£{RVS}£{RVS}
    {14 SPACES}";                  :rem 250
130 PRINT"{RVS}{14 SPACES}{RIGHT} {G}
    {RIGHT} {2 RIGHT} {OFF}£{RVS}£{*}
    {OFF}{*}{RVS}{14 SPACES}";     :rem 35
140 PRINT"{RVS}{41 SPACES}"        :rem 120
200 PRINT"{2 DOWN}{PUR}{BLK} MACHINE LANG
    UAGE EDITOR VERSION 2.01{5 DOWN}"
                                   :rem 237
210 PRINT"{5}{2 UP}STARTING ADDRESS?
    {8 SPACES}{9 LEFT}";           :rem 143
215 INPUTS:F=1-F:C$=CHR$(31+119*F)
                                   :rem 166
220 IFS<256OR(S>40960ANDS<49152)ORS>53247
    THENGOSUB3000:GOTO210          :rem 235
225 PRINT:PRINT:PRINT              :rem 180
230 PRINT"{5}{2 UP}ENDING ADDRESS?
    {8 SPACES}{9 LEFT}";:INPUTE:F=1-F:C$=
    CHR$(31+119*F)                 :rem 20
240 IFE<256OR(E>40960ANDE<49152)ORE>53247
    THENGOSUB3000:GOTO230          :rem 183
250 IFE<STHENPRINTC$;"{RVS}ENDING < START
    {2 SPACES}":GOSUB1000:GOTO 230
                                   :rem 176
260 PRINT:PRINT:PRINT              :rem 179
300 PRINT"{CLR}";CHR$(14):AD=S:POKEV+21,0
                                   :rem 225
310 A=1:PRINTRIGHT$("0000"+MID$(STR$(AD),
    2),5);":";                     :rem 33
315 FORJ=ATO6                      :rem 33
320 GOSUB570:IFN=-1THENJ=J+N:GOTO320
                                   :rem 228
390 IFN=-211THEN 710               :rem 62
400 IFN=-204THEN 790               :rem 64
410 IFN=-206THENPRINT:INPUT"{DOWN}ENTER N
    EW ADDRESS";ZZ                 :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETHENPRINT"
    {RVS}OUT OF RANGE":GOSUB1000:GOTO410
                                   :rem 225
417 IFN=-206THENAD=ZZ:PRINT:GOTO310
                                   :rem 238
420 IF N<>-196 THEN 480            :rem 133
430 PRINT:INPUT"DISPLAY:FROM";F:PRINT,"TO
    ";:INPUTT                      :rem 234
```

```
440 IFF<SORF>EORT<SORT>ETHENPRINT"AT LEAS
    T";S;"{LEFT}, NOT MORE THAN";E:GOTO43
    0                                  :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINTRIGHT$("000
    0"+MID$(STR$(I),2),5);":";         :rem 30
451 FORK=0TO5:N=PEEK(I+K):PRINTRIGHT$("00
    "+MID$(STR$(N),2),3);",";          :rem 66
460 GETA$:IFA$>""THENPRINT:PRINT:GOTO310
                                       :rem 25
470 NEXTK:PRINTCHR$(20);:NEXTI:PRINT:PRIN
    T:GOTO310                          :rem 50
480 IFN<0 THEN PRINT:GOTO310           :rem 168
490 A(J)=N:NEXTJ                       :rem 199
500 CKSUM=AD-INT(AD/256)*256:FORI=1TO6:CK
    SUM=(CKSUM+A(I))AND255:NEXT        :rem 200
510 PRINTCHR$(18);:GOSUB570:PRINTCHR$(146
    );                                 :rem 94
511 IFN=-1THENA=6:GOTO315              :rem 254
515 PRINTCHR$(20):IFN=CKSUMTHEN530
                                       :rem 122
520 PRINT:PRINT"LINE ENTERED WRONG : RE-E
    NTER":PRINT:GOSUB1000:GOTO310:rem 176
530 GOSUB2000                          :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):NEXT:POKE54
    272,0:POKE54273,0                  :rem 227
550 AD=AD+6:IF AD<E THEN 310           :rem 212
560 GOTO 710                           :rem 108
570 N=0:Z=0                            :rem 88
580 PRINT"{££}";                       :rem 81
581 GETA$:IFA$=""THEN581               :rem 95
582 AV=-(A$="M")-2*(A$=",")-3*(A$=".")-4*
    (A$="J")-5*(A$="K")-6*(A$="L"):rem 41
583 AV=AV-7*(A$="U")-8*(A$="I")-9*(A$="O"
    ):IFA$="H"THENA$="0"               :rem 134
584 IFAV>0THENA$=CHR$(48+AV)           :rem 134
585 PRINTCHR$(20);:A=ASC(A$):IFA=13ORA=44
    ORA=32THEN670                      :rem 229
590 IFA>128THENN=-A:RETURN             :rem 137
600 IFA<>20 THEN 630                   :rem 10
610 GOSUB690:IFI=1ANDT=44THENN=-1:PRINT"
    {OFF}{LEFT} {LEFT}";:GOTO690       :rem 62
620 GOTO570                            :rem 109
630 IFA<48ORA>57THEN580                :rem 105
640 PRINTA$;:N=N*10+A-48               :rem 106
650 IFN>255 THEN A=20:GOSUB1000:GOTO600
                                       :rem 229
660 Z=Z+1:IFZ<3THEN580                 :rem 71
670 IFZ=0THENGOSUB1000:GOTO570         :rem 114
680 PRINT",";:RETURN                   :rem 240
690 S%=PEEK(209)+256*PEEK(210)+PEEK(211)
                                       :rem 149
691 FORI=1TO3:T=PEEK(S%-I)             :rem 67
695 IFT<>44ANDT<>58THENPOKES%-I,32:NEXT
                                       :rem 205
700 PRINTLEFT$("{3 LEFT}",I-1);:RETURN
                                       :rem 7
710 PRINT"{CLR}{RVS}*** SAVE ***{3 DOWN}"
                                       :rem 236
715 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF}
     ALONE TO CANCEL SAVE){DOWN}":rem 106
720 F$="":INPUT"{DOWN} FILENAME";F$:IFF$=
    ""THENPRINT:PRINT:GOTO310          :rem 71
730 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"            :rem 228
740 GETA$:IFA$<>"T"ANDA$<>"D"THEN740
                                       :rem 36
750 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$:
    OPEN15,8,15,"S"+F$:CLOSE15         :rem 212
760 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                   :rem 3
762 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                       :rem 109
763 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                                 :rem 69
765 K=S:POKE254,K/256:POKE253,K-PEEK(254)
    *256:POKE780,253                   :rem 17
766 K=E+1:POKE782,K/256:POKE781,K-PEEK(78
    2)*256:SYS65496                    :rem 235
770 IF(PEEK(783)AND1)OR(191ANDST)THEN780
                                       :rem 111
775 PRINT"{DOWN}DONE.{DOWN}":GOTO310
                                       :rem 113
780 PRINT"{DOWN}ERROR ON SAVE.{2 SPACES}T
    RY AGAIN.":IFDV=1THEN720           :rem 171
781 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO720               :rem 103
790 PRINT"{CLR}{RVS}*** LOAD ***{2 DOWN}"
                                       :rem 212
795 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF}
     ALONE TO CANCEL LOAD)"            :rem 82
800 F$="":INPUT"{2 DOWN} FILENAME";F$:IFF
    $=""THENPRINT:GOTO310              :rem 144
810 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"            :rem 227
820 GETA$:IFA$<>"T"ANDA$<>"D"THEN820
                                       :rem 34
830 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                       :rem 157
840 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                   :rem 2
841 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                       :rem 107
845 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                                 :rem 70
850 POKE780,0:SYS65493                 :rem 11
860 IF(PEEK(783)AND1)OR(191ANDST)THEN870
                                       :rem 111
865 PRINT"{DOWN}DONE.":GOTO310         :rem 96
870 PRINT"{DOWN}ERROR ON LOAD.{2 SPACES}T
    RY AGAIN.{DOWN}":IFDV=1THEN800
                                       :rem 172
880 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO800               :rem 102
1000 REM BUZZER                        :rem 135
1001 POKE54296,15:POKE54277,45:POKE54278,
     165                               :rem 207
1002 POKE54276,33:POKE 54273,6:POKE54272,
     5                                 :rem 42
1003 FORT=1TO200:NEXT:POKE54276,32:POKE54
     273,0:POKE54272,0:RETURN          :rem 202
2000 REM BELL SOUND                    :rem 78
2001 POKE54296,15:POKE54277,0:POKE54278,2
     47                                :rem 152
2002 POKE 54276,17:POKE54273,40:POKE54272
     ,0                                :rem 86
2003 FORT=1TO100:NEXT:POKE54276,16:RETURN
                                       :rem 57
3000 PRINTC$;"{RVS}NOT ZERO PAGE OR ROM":
     GOTO1000                          :rem 89
```

Power BASIC

See article on page 110.

Program 1: Color Chart—VIC Version

```
10 FOR ADRES=828TO 874:READ DATTA:POKE AD
   RES,DATTA:NEXT ADRES                :rem 250
20 PRINT CHR$(147):A=PEEK(648)*256:FOR I=
   A TO A+512:POKE I,160:NEXT I        :rem 58
```

```
30 PRINT:FOR I=0 TO 15:PRINT:PRINT TAB(7)
   ;:FOR J=0 TO 7                    :rem 170
40 POKE 646,J:PRINTCHR$(J+48);:NEXT J,I:P
   RINT:PRINT                        :rem 164
50 POKE 646,1:PRINTCHR$(18);"THIS CHART S
   HOWS ALL{2 SPACES}";              :rem 228
60 PRINT"COMBINATIONS OF LETTER";    :rem 93
70 PRINT"AND BACKGROUND COLORS";     :rem 248
80 SYS828                            :rem 9
828 DATA 169,41,133,251,169,9        :rem 165
834 DATA 141,15,144,162,15,120       :rem 188
840 DATA 173,4,144,197,251,208       :rem 205
846 DATA 249,173,15,144,24,105       :rem 205
852 DATA 16,234,234,234,234,234      :rem 249
858 DATA 234,234,141,15,144,165      :rem 254
864 DATA 251,24,105,4,133,251        :rem 143
870 DATA 202,16,223,48,209           :rem 2
```

Program 2: Color Chart—64 Version

```
40 FOR I=49152 TO 49188: READ A: POKE I,A
   : NEXT:POKE 53280,11              :rem 175
50 PRINT CHR$(147):FOR I=1024 TO I+1000:
   {SPACE}POKE I,160: POKE I+54272,11:NEX
   TI                                :rem 204
60 FOR I=0 TO 15: FOR J=0 TO 15      :rem 237
70 P=1196+(40*I)+J: POKE P,J+1: POKE P+54
   272,J: NEXT J,I                   :rem 174
80 PRINT TAB(15)CHR$(5)"COLOR CHART":FOR
   {SPACE}I=1 TO 19:PRINT:NEXT       :rem 100
85 PRINT"THIS CHART SHOWS ALL COMBINATION
   S OF{3 SPACES}"                   :rem 112
86 PRINT "FOREGROUND AND BACKGROUND COLOR
   S.{6 SPACES}"                     :rem 237
87 PRINT "FOREGROUND INCREASES FROM LEFT
   {SPACE}TO RIGHT"                  :rem 88
88 PRINT "BACKGROUND INCREASES FROM TOP T
   O BOTTOM";                        :rem 152
90 SYS 12*4096                       :rem 200
100 DATA 169,90,133,251,169,0,141,33,208,
    162,15,120                       :rem 191
105 DATA 173,17,208,48,251,173,18,208
                                     :rem 35
110 DATA 197,251,208,249,238,33,208,24,10
    5,8,133,251,202,16,233,48,219:rem 121
```

Beekeeper

See article on page 42.

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: Beekeeper For VIC-20

```
10 POKE51,0:POKE52,28:POKE56,28:POKE55,0:
   CLR:DIMSP(8)                      :rem 172
20 PRINT"{CLR}":POKE36869,255:POKE36878,1
   5                                 :rem 18
30 FORI=7168TO7679:POKEI,PEEK(I+25600):NE
   XT:V=1:SC=0                       :rem 159
40 GOSUB500:GOSUB800:GOSUB600        :rem 27
45 GOSUB700                          :rem 128
50 S=PEEK(S2):SW=(SAND16)/16:F=(SAND32)/3
   2                                 :rem 178
60 POKES1,127:S=PEEK(S3):SR=(SAND128)/128
   :POKES1,255                       :rem 82
70 IFF=1THEN130                      :rem 109
80 I=1:A=SH-32:J=P1:POKE36877,200:rem 124
90 J=J+SP(A):IFJ<SAORJ>8185THEN120:rem 62
100 IFPEEK(J)<>32THENPOKEBN,32:GOSUB310:G
    OTO120                           :rem 146
110 POKEBN,32:POKEJ,42:POKEBBN+CM,3:BN=J:
    I=I+1:IFI<8THEN90                :rem 80
120 POKEBN,32:POKE36877,0            :rem 183
130 IFSW=1THENIFSR=1THEN200          :rem 205
140 CC=1:IFSW=0THENCC=-1             :rem 185
150 POKE36874,0:IFP1=P2THENJ=P1:GOSUB310
                                     :rem 187
160 IFSH=40THENIFCC=1THENCC=-7       :rem 106
170 IFSH=33THENIFCC=-1THENCC=7       :rem 109
180 SH=SH+CC:POKEP1,SH:POKE36874,150
                                     :rem 165
200 A=SH-32:MN=P1:P1=P1+SP(A):IFP1<SAORP1
    >SETHENP1=MN                     :rem 67
210 IFPEEK(P1)<>32THENJ=P1:POKEMN,32:GOSU
    B300                             :rem 17
220 POKEMN,32:POKEP1,SH:IFW=1THEN250
                                     :rem 244
230 P2=INT(RND(1)*21)+8054:MC=INT(RND(1)*
    6)+1:SX=41:SY=32:BC=3:W=1        :rem 33
240 IFMC=2THENSX=44:SY=43:BC=5       :rem 94
250 A=SGN(P2-P1):M0=P2:P2=P2-A*H:IFABS(P2
    -P1)>12THENP2=P2-A*21            :rem 123
260 IFP2<SAORP2>SETHENP2=M0          :rem 221
270 IFA=0THENJ=P2:GOSUB310:GOTO50 :rem 52
280 POKECM+P2,MC:POKEM0,SY:POKEP2,SX:POKE
    CM+M0,BC:GOTO50                  :rem 108

300 A=PEEK(J):IFA=43ORA<41THENP1=MN:GOTO4
    80                               :rem 153
310 FORI=1TO5:POKEJ,42:POKEJ+CM,2:POKE368
    77,150:POKE36874,200:POKEJ,32:NEXT
                                     :rem 69
320 POKEJ+CM,3:N=SQ:IFJ=P2THENW=0:SC=SC+1
    50                               :rem 186
330 IFP1=P2ORA=41THENSQ=SQ-1:P1=8043:SH=3
    9                                :rem 64
340 IFJ>8119THENSC=SC+50:AQ=AQ-1 :rem 162
350 SC=SC+50:IFSC>HITHENHI=SC        :rem 82
360 IFSC>99999THENSC=0               :rem 75
370 PRINT"{HOME}{YEL}SCORE:"SC;TAB(13)"SH
    IPS:"SQ:POKEP1+CM,3:POKEP1,SH:POKE368
    77,0                             :rem 97
380 IFSQ=NTHEN410                    :rem 29
390 FORI=1TO5:FORS=180TO235STEP2:POKE3687
    6,S:FORA=1TO10:NEXT:NEXT         :rem 195
400 POKE36876,0:FORJ=1TO100:NEXT:NEXT
                                     :rem 44
410 IFAQ=0THENV=V+1:PRINT"{CLR}{RED}
    {11 DOWN}{8 RIGHT}SWARM"V:FORI=1TO400
    0:NEXT:GOTO45                    :rem 104
420 IFSQ<>0THEN480                   :rem 62
425 POKE36877,0:POKE36874,0:POKE36876,0
                                     :rem 217
430 PRINT"{HOME}{RED}{7 DOWN}{5 RIGHT}* G
    AME OVER *":PRINT"{4 DOWN}{2 RIGHT}TR
    Y AGAIN? [Y OR N]"               :rem 112
440 GETA$:IFA$=""THEN440             :rem 83
450 IFA$="Y"THENRESTORE:GOTO20       :rem 143
460 IFA$<>"N"THEN440                 :rem 97
470 PRINT"{CLR}":FORI=36874TO36878:POKEI,
    0:NEXT:POKE52,30:POKE56,30:POKE36869,
    240:END                          :rem 250
```

```
480 RETURN                              :rem 124
500 POKE36879,125:PRINT"{RED}{7 DOWN}
    {5 RIGHT}*{BLU}BEEKEEPER{RED}*"
                                        :rem 223
510 PRINT"{GRN}{7 DOWN}{5 RIGHT}HI SCORE=
    {BLU}"HI                            :rem 135
520 FORI=1TO8000:NEXT:RETURN            :rem 51
600 POKE36879,31:PRINT"{CLR}{RED}{DOWN}
    {RIGHT}USE JOYSTICK TO PLAY":PRINT"
    {BLU}{2 DOWN}{RIGHT}BEE"TAB(11)")"SPC
    (5)"100"                            :rem 241
610 PRINT"{GRN}{DOWN}{RIGHT}CLOVER"TAB(11
    )"+"SPC(6)"50":PRINT"{RED}{DOWN}
    {RIGHT}CRAB"TAB(11)","SPC(5)"200"
                                        :rem 55
620 PRINT"{YEL}{DOWN}{RIGHT}HIVE"TAB(11)"
    @"SPC(6)"50":PRINT"{BLU}{2 DOWN}
    {RIGHT}DIFFICULTY LEVELS..."        :rem 54
630 PRINT"{RED}{DOWN}{4 RIGHT}[1] BEGINNE
    R":PRINT"{DOWN}{4 RIGHT}[2] ADVANCED"
    :PRINT"{DOWN}{4 RIGHT}[3] MASTER"
                                        :rem 53
640 PRINT"{BLU}{DOWN}{RIGHT}KEY IN YOUR L
    EVEL:"                              :rem 57
650 GETA$:IFA$=""THEN650                :rem 89
660 H=VAL(A$):IFH<1ORH>3THEN650         :rem 92
670 RETURN                              :rem 125
700 P1=8043:SH=39:CM=30720:S1=37154:SQ=8:
    SA=7702:SE=8075                     :rem 181
710 CT=38400:CE=38905:S2=37137:S3=37152:A
    Q=66:BN=SA                          :rem 131
720 PRINT"{CLR}":POKE36879,INT(RND(1)*5)+
    10:FORI=CTTOCE:POKEI,3:NEXT         :rem 35
730 FORI=1TO50:A=INT(RND(1)*372)+SA:POKEC
    M+A,5:POKEA,43:NEXT                 :rem 155
740 FORI=8076TO8119:POKEI+CM,7:POKEI,0:NE
    XT                                  :rem 170
750 FORI=8120TO8185:POKEI+CM,INT(RND(1)*6
    )+1:POKEI,41:NEXT                   :rem 0
760 PRINT"{HOME}{YEL}SCORE:"SC;TAB(13)"SH
    IPS:"SQ:POKEP1+CM,3:POKEP1,SH:POKE368
    74,150:RETURN                       :rem 225
800 FORI=1TO8:READSP(I):NEXT            :rem 29
810 DATA 1,23,22,21,-1,-23,-22,-21:rem 85
820 FORI=7432TO7503:READA:POKEI,A:NEXT:FO
    RI=7520TO7527:READA:POKEI,A:NEXT
                                        :rem 148
830 FORI=7168TO7175:POKEI,255:NEXT:FORI=7
    512TO7519:POKEI,PEEK(I+25960):NEXT
                                        :rem 126
840 DATA0,96,112,120,207,120,112,96,8,92,
    60,108,244,126,6,1                  :rem 123
850 DATA16,254,254,108,56,16,16,16,16,58,
    60,54,47,126,96,128                 :rem 210
860 DATA0,6,14,30,243,30,14,6,128,96,126,
    47,54,60,58,16                      :rem 194
870 DATA16,16,16,56,108,254,254,16,1,6,12
    6,244,108,60,92,8                   :rem 95
880 DATA195,231,231,126,60,219,189,36,66,
    102,129,189,126,219,189,36          :rem 60
890 RETURN                              :rem 129
```

Program 2: Beekeeper For 64

```
1 POKE56,48:POKE55,0:CLR                :rem 173
5 POKE53280,2:POKE53281,0               :rem 140
10 DIMSP(8)                             :rem 103
20 PRINT"{CLR}"                         :rem 198
30 V=1:SC=0:CM=54272                    :rem 111
40 GOSUB500:GOSUB800:GOSUB600           :rem 27
41 POKECM+24,15:POKECM+5,17:POKECM+6,241:
   POKECM,0:POKECM+12,17:POKECM+13,241
                                        :rem 12
42 POKECM+7,0                           :rem 227
45 GOSUB700                             :rem 128
50 S=PEEK(56320):SW=(SAND4)/4:F=(SAND16)/
   16                                   :rem 203
60 SR=(SAND8)/8                         :rem 94
70 IFF=1THEN130                         :rem 109
80 I=1:A=SH-32:J=P1:POKECM+8,200:POKECM+1
   1,129                                :rem 174
90 J=J+SP(A):IFJ<SAORJ>2023THEN120:rem 47
100 IFPEEK(J)<>32THENPOKEBN,32:GOSUB310:G
    OTO120                              :rem 146
110 POKEBN,32:POKEJ,42:POKEBBN+CM,3:BN=J:
    I=I+1:IFI<8THEN90                   :rem 80
120 POKEBN,32:POKECM+11,128             :rem 48
130 IFSW=1THENIFSR=1THEN200             :rem 205
140 CC=1:IFSW=0THENCC=-1                :rem 185
150 POKECM+1,50:POKECM+4,33:IFP1=P2THENJ=
    P1:GOSUB310                         :rem 186
160 IFSH=40THENIFCC=1THENCC=-7          :rem 106
170 IFSH=33THENIFCC=-1THENCC=7          :rem 109
180 SH=SH+CC:POKEP1,SH:POKECM+4,32:rem 87
200 A=SH-32:MN=P1:P1=P1+SP(A):IFP1<SAORP1
    >SETHENP1=MN                        :rem 67
210 IFPEEK(P1)<>32THENJ=P1:POKEMN,32:GOSU
    B300                                :rem 17
220 POKEMN,32:POKEP1,SH:IFW=1THEN250
                                        :rem 244
230 P2=INT(RND(1)*21)+1783:MC=INT(RND(1)*
    6)+1:SX=41:SY=32:BC=3:W=1           :rem 35
240 IFMC=2THENSX=44:SY=43:BC=5          :rem 94
250 A=SGN(P2-P1):M0=P2:P2=P2-A*H:IFABS(P2
    -P1)>25THENP2=P2-A*40               :rem 128
260 IFP2<SAORP2>SETHENP2=M0             :rem 221
270 IFA=0THENJ=P2:GOSUB310:GOTO50 :rem 52
280 POKECM+P2,MC:POKEM0,SY:POKEP2,SX:POKE
    CM+M0,BC:GOTO50                     :rem 108
300 A=PEEK(J):IFA=43ORA<41THENP1=MN:GOTO4
    80                                  :rem 153
310 FORI=1TO5:POKEJ,42:POKEJ+CM,2:POKECM+
    7,50:POKECM+11,129                  :rem 85
311 POKECM+1,60:POKECM+4,33:POKEJ,32:NEXT
                                        :rem 233
320 POKEJ+CM,3:N=SQ:IFJ=P2THENW=0:SC=SC+1
    50                                  :rem 186
330 IFP1=P2ORA=41THENSQ=SQ-1:P1=1764:SH=3
    9                                   :rem 67
340 IFJ>1903THENSC=SC+50:AQ=AQ-1 :rem 156
350 SC=SC+50:IFSC>HITHENHI=SC           :rem 82
370 PRINT"{HOME}{YEL}SCORE:"SC;TAB(32)"SH
    IPS:"SQ:POKEP1+CM,3:POKEP1,SH:POKECM+
    11,128                              :rem 219
380 IFSQ=NTHEN410                       :rem 29
390 FORI=1TO5:FORS=10TO80STEP2:POKECM+1,S
    :POKECM+4,33:FORA=1TO10:NEXT:NEXT
                                        :rem 33
400 POKECM+4,32:FORJ=1TO100:NEXT:NEXT
                                        :rem 66
410 IFAQ=0THENV=V+1:PRINT"{CLR}{RED}
    {11 DOWN}{8 RIGHT}SWARM"V:FORI=1TO400
    0:NEXT:GOTO45                       :rem 104
420 IFSQ<>0THEN480                      :rem 62
430 PRINT"{HOME}{RED}{8 DOWN}"SPC(14)"* G
    AME OVER *"                         :rem 169
435 PRINTSPC(11)"{4 DOWN}TRY AGAIN? [Y OR
     N]"                                :rem 232
440 GETA$:IFA$=""THEN440                :rem 83
450 IFA$="Y"THENRESTORE:GOTO20          :rem 143
460 IFA$<>"N"THEN440                    :rem 97
```

```
470 PRINT"{CLR}":END                    :rem 16
480 RETURN                              :rem 124
500 PRINT"{RED}{8 DOWN}{14 RIGHT}*{CYN}BE
    EKEEPER{RED}*"                      :rem 55
510 PRINT"{GRN}{8 DOWN}{14 RIGHT}HI SCORE
    ={YEL}"HI                           :rem 28
520 FORI=1TO3000:NEXT:RETURN            :rem 46
600 PRINT"{CLR}"SPC(10)"{RED}{DOWN}USE JO
    YSTICK TO PLAY"                     :rem 57
605 PRINTSPC(10)"{BLU}{2 DOWN}BEE"TAB(20)
    ")"SPC(5)"100"                      :rem 73
610 PRINTSPC(10)"{GRN}{DOWN}CLOVER"TAB(20
    )"+"SPC(6)"50"                      :rem 9
615 PRINTSPC(10)"{RED}{DOWN}CRAB"TAB(20)"
    ,"SPC(5)"200"                       :rem 134
620 PRINTSPC(10)"{YEL}{DOWN}HIVE"TAB(20)"
    @"SPC(6)"50"                        :rem 0
625 PRINTSPC(10)"{BLU}{2 DOWN}DIFFICULTY
    {SPACE}LEVELS..."                   :rem 143
630 PRINTSPC(14)"{RED}{DOWN}[1] BEGINNER"
                                        :rem 102
635 PRINTSPC(14)"{DOWN}[2] ADVANCED":PRIN
    TSPC(14)"{DOWN}[3] MASTER"          :rem 171
640 PRINTSPC(11)"{BLU}{DOWN}KEY IN YOUR L
    EVEL:"                              :rem 181
650 GETA$:IFA$=""THEN650                :rem 89
660 H=VAL(A$):IFH<1ORH>3THEN650         :rem 92
670 RETURN                              :rem 125
700 P1=1764:SH=39:SQ=8:SA=1064:SE=1823
                                        :rem 171
710 CT=55296:CE=56295:AQ=66:BN=SA:rem 145
720 PRINT"{CLR}":FORI=CTTOCE:POKEI,3:NEXT
                                        :rem 240
730 FORI=1TO50:A=INT(RND(1)*758)+SA:POKEC
    M+A,5:POKEA,43:NEXT                 :rem 163
740 FORI=1824TO1903:POKEI+CM,7:POKEI,0:NE
    XT                                  :rem 158
750 FORI=1904TO2023:POKEI+CM,INT(RND(1)*6
    )+1:POKEI,41:NEXT                   :rem 244
760 PRINT"{HOME}{YEL}SCORE:"SC;TAB(32)"SH
    IPS:"SQ:POKEP1+CM,3:POKEP1,SH:RETURN
                                        :rem 171
800 FORI=1TO8:READSP(I):NEXT:IFPEEK(251)=
    123THENPOKE53272,29:RETURN          :rem 217
805 PRINT"{7 UP}{9 RIGHT}REDEFINING CHARA
    CTERS"                              :rem 37
807 POKE251,123                         :rem 40
810 DATA 1,41,40,39,-1,-41,-40,-39
                                        :rem 103
815 POKE56334,PEEK(56334)AND254:POKE1,PEE
    K(1)AND251                          :rem 191
816 FORI=0TO511:POKEI+12288,PEEK(I+53248)
    :NEXT                               :rem 237
820 FORI=12552TO12623:READA:POKEI,A:NEXT:
    FORI=12640TO12647:READA:POKEI,A:NEXT
                                        :rem 80
830 FORI=12288TO12295:POKEI,255:NEXT:FORI
    =12632TO12639:READA:POKEI,A:NEXT
                                        :rem 34
835 POKE1,PEEK(1)OR4:POKE56334,PEEK(56334
    )OR1                                :rem 143
836 POKE53272,(PEEK(53272)AND240)+12
                                        :rem 192
840 DATA0,96,112,120,207,120,112,96,8,92,
    60,108,244,126,6,1                  :rem 123
850 DATA16,254,254,108,56,16,16,16,16,58,
    60,54,47,126,96,128                 :rem 210
860 DATA0,6,14,30,243,30,14,6,128,96,126,
    47,54,60,58,16                      :rem 194
870 DATA16,16,16,56,108,254,254,16,1,6,12
    6,244,108,60,92,8                   :rem 95
880 DATA195,231,231,126,60,219,189,36,66,
    102,129,189,126,219,189,36          :rem 60
885 DATA24,24,102,102,24,24,60,0        :rem 71
890 RETURN                              :rem 129
```

Ultrafont +

See article on page 28.

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
49152 :076,200,196,000,001,003,220
49158 :004,000,173,048,002,072,049
49164 :173,045,002,141,048,002,167
49170 :141,079,002,032,043,193,252
49176 :104,141,048,002,169,100,076
49182 :133,252,169,000,133,251,200
49188 :133,167,169,216,133,168,254
49194 :169,008,141,040,002,169,059
49200 :002,141,042,002,169,005,153
49206 :141,041,002,174,003,192,095
49212 :173,079,002,205,048,002,057
49218 :208,002,162,006,142,080,154
49224 :002,160,000,177,253,170,066
49230 :173,063,002,240,003,076,123
49236 :229,192,169,207,145,251,253
49242 :138,010,170,176,008,173,253
49248 :080,002,145,167,076,108,162
49254 :192,173,004,192,145,167,207
49260 :200,192,008,208,221,024,193
49266 :165,251,105,008,133,251,003
49272 :133,167,165,252,105,000,174
49278 :133,252,105,116,133,168,009
49284 :024,165,253,105,008,133,052
49290 :253,165,254,105,000,133,024
49296 :254,056,238,079,002,206,211
49302 :041,002,173,041,002,208,105
49308 :156,056,173,079,002,233,087
49314 :005,141,079,002,056,165,098
49320 :253,233,039,133,253,165,220
49326 :254,233,000,133,254,206,230
49332 :040,002,173,040,002,240,165
49338 :003,076,052,192,206,042,245
49344 :002,173,042,002,240,030,169
49350 :169,008,141,040,002,024,070
49356 :173,079,002,105,032,141,224
49362 :079,002,024,165,253,105,070
49368 :248,133,253,165,254,105,094
49374 :000,133,254,076,052,192,161
49380 :096,134,097,169,000,141,097
49386 :043,002,006,097,046,043,215
49392 :002,006,097,046,043,002,180
49398 :174,043,002,169,207,145,218
49404 :251,200,169,247,145,251,235
49410 :136,189,003,192,145,167,066
49416 :200,145,167,200,192,008,152
49422 :208,215,076,113,192,169,219
49428 :000,141,026,208,165,001,049
49434 :041,251,133,001,096,165,201
49440 :001,009,004,133,001,169,093
49446 :001,141,026,208,096,169,167
49452 :000,133,254,173,048,002,142
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49458 :133,253,006,253,038,254,219
49464 :006,253,038,254,006,253,098
49470 :038,254,024,169,112,101,248
49476 :254,133,254,096,032,043,112
49482 :193,160,000,177,253,073,162
49488 :255,145,253,200,192,008,109
49494 :208,245,032,008,192,096,099
49500 :169,102,133,252,169,218,111
49506 :133,168,169,132,133,251,060
49512 :133,167,162,008,169,000,231
49518 :133,097,160,000,165,097,250
49524 :145,251,230,097,173,058,046
49530 :002,145,167,200,192,032,092
49536 :208,240,024,165,251,105,097
49542 :040,133,251,133,167,165,255
49548 :252,105,000,133,252,105,219
49554 :116,133,168,202,208,216,165
49560 :096,032,043,203,173,044,231
49566 :002,141,024,208,169,200,134
49572 :013,063,002,141,022,208,101
49578 :169,000,141,032,208,141,093
49584 :033,208,032,092,193,173,139
49590 :058,002,141,134,002,165,172
49596 :209,133,243,024,165,210,148
49602 :105,116,133,244,164,211,143
49608 :177,209,073,128,145,209,117
49614 :177,243,072,173,134,002,239
49620 :145,243,032,228,255,240,075
49626 :251,170,164,211,177,209,120
49632 :073,128,145,209,104,145,004

49638 :243,138,032,210,255,032,116
49644 :225,255,208,203,032,075,210
49650 :203,169,000,141,134,002,123
49656 :169,012,141,032,208,076,118
49662 :094,196,032,019,193,169,189
49668 :112,133,252,173,082,002,246
49674 :133,254,162,008,169,000,224
49680 :133,253,133,251,168,177,107
49686 :253,145,251,200,208,249,048
49692 :230,254,230,252,202,208,124
49698 :242,165,252,201,128,240,238
49704 :007,169,208,133,254,076,119
49710 :012,194,032,031,193,096,092
49716 :169,112,133,252,169,116,235
49722 :133,254,169,000,133,253,232
49728 :133,251,168,162,004,177,191
49734 :251,073,255,145,253,200,223
49740 :208,247,230,254,230,252,217
49746 :202,208,240,096,032,043,135
49752 :193,160,000,177,253,010,113
49758 :008,074,040,042,145,253,144
49764 :200,192,008,208,242,076,002
49770 :008,192,032,043,193,160,222
49776 :000,177,253,074,008,010,122
49782 :040,106,145,253,200,192,030
49788 :008,208,242,076,008,192,090
49794 :032,043,193,160,000,177,223
49800 :253,133,097,200,177,253,225
49806 :136,145,253,200,200,192,244
49812 :008,208,245,165,097,136,239

49818 :145,253,076,008,192,032,092
49824 :043,193,160,007,177,253,225
49830 :133,097,136,177,253,200,138
49836 :145,253,136,016,247,200,145
49842 :165,097,145,253,076,008,154
49848 :192,032,043,193,160,000,036
49854 :169,000,133,097,162,008,247
49860 :177,253,010,102,097,202,013
49866 :208,250,165,097,145,253,040

49872 :200,192,008,208,233,076,101
49878 :008,192,032,043,193,160,074
49884 :008,169,000,153,048,002,088
49890 :136,208,250,169,007,133,105
49896 :097,152,170,169,000,133,185
49902 :007,177,253,074,145,253,123
49908 :038,007,202,016,251,166,156
49914 :097,165,007,029,049,002,087
49920 :157,049,002,198,097,165,156
49926 :097,016,224,200,192,008,231
49932 :208,215,136,185,049,002,039
49938 :145,253,136,016,248,076,124
49944 :008,192,032,043,193,160,140
49950 :000,152,145,253,200,192,204
49956 :008,208,249,076,008,192,009
49962 :120,169,127,141,013,220,064
49968 :169,001,141,026,208,169,250
49974 :177,141,018,208,169,027,026
49980 :141,017,208,169,075,141,043
49986 :020,003,169,195,141,021,103
49992 :003,088,096,173,018,208,146
49998 :201,177,208,039,169,242,090
50004 :141,018,208,173,044,002,158
50010 :141,024,208,173,022,208,098
50016 :041,239,013,063,002,141,083
50022 :022,208,173,057,002,141,193
50028 :033,208,169,001,141,025,173
50034 :208,104,168,104,170,104,204
50040 :064,169,177,141,018,208,129
50046 :169,158,141,024,208,173,231

50052 :032,208,141,033,208,169,155
50058 :200,141,022,208,238,037,216
50064 :208,169,001,141,025,208,128
50070 :076,049,234,085,064,000,146
50076 :064,064,000,076,064,000,168
50082 :076,064,000,076,064,000,186
50088 :076,064,000,064,064,000,180
50094 :085,064,000,000,000,085,152
50100 :080,000,064,016,000,064,148
50106 :016,000,064,016,000,064,090
50112 :016,000,064,016,000,064,096
50118 :016,000,064,016,000,064,102
50124 :016,000,085,080,000,000,129
50130 :000,000,255,255,255,000,207
50136 :001,001,001,000,255,001,219
50142 :000,000,255,001,000,000,222
50148 :255,001,018,085,076,084,235
50154 :082,065,070,079,078,084,180
50160 :032,043,146,095,069,082,195
50166 :082,079,082,032,079,078,166
50172 :032,083,065,086,069,047,122
50178 :076,079,065,068,095,018,147
50184 :084,146,065,080,069,032,228
50190 :079,082,032,018,068,146,183
50196 :073,083,075,063,095,070,223
50202 :073,076,069,078,065,077,208
50208 :069,058,095,069,078,084,229
50214 :069,082,032,067,079,076,187
50220 :079,082,032,075,069,089,214
50226 :095,085,083,069,032,082,240
50232 :079,077,032,083,069,084,224
50238 :063,032,040,089,047,078,155
50244 :041,095,018,085,146,080,021
50250 :080,069,082,067,065,083,008
50256 :069,032,079,082,032,018,136
50262 :076,146,079,087,069,082,113

50268 :063,095,169,230,160,195,236
50274 :133,251,132,252,160,040,042
50280 :169,032,153,191,103,136,120
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50286 :208,250,177,251,200,201,117
50292 :095,208,249,136,132,097,009
50298 :152,074,073,255,056,105,069
50304 :020,168,162,024,024,032,046
50310 :240,255,160,000,177,251,193
50316 :032,210,255,200,196,097,106
50322 :144,246,096,133,251,132,124
50328 :252,160,040,169,032,153,190
50334 :191,103,136,208,250,162,184
50340 :024,160,000,024,032,240,132
50346 :255,160,000,177,251,201,190
50352 :095,240,006,032,210,255,246
50358 :200,208,244,096,174,076,156
50364 :002,240,008,160,000,200,030
50370 :208,253,202,208,250,096,131
50376 :173,002,221,009,003,141,237
50382 :002,221,173,000,221,041,096
50388 :252,009,002,141,000,221,069
50394 :169,100,141,136,002,169,167
50400 :147,032,210,255,169,000,013
50406 :141,134,002,169,008,032,204
50412 :210,255,160,000,152,153,142
50418 :128,099,200,016,250,168,079
50424 :185,153,195,153,128,099,137
50430 :200,192,023,208,245,160,002
50436 :000,185,176,195,153,192,137
50442 :099,200,192,032,208,245,218
50448 :169,156,141,044,002,169,185
50454 :012,141,032,208,169,128,200
50460 :141,138,002,032,042,195,066
50466 :169,048,141,076,002,169,127
50472 :011,141,057,002,169,007,171
50478 :169,000,141,048,002,141,035
50484 :045,002,141,063,002,173,222
50490 :006,192,009,008,141,058,216
50496 :002,173,004,192,141,034,098
50502 :208,173,005,192,141,035,056
50508 :208,032,008,192,032,092,128
50514 :193,169,203,205,007,192,027
50520 :240,014,141,007,192,162,076
50526 :208,142,082,002,032,000,048
50532 :194,076,120,197,169,051,139
50538 :160,196,032,098,196,032,052
50544 :228,255,240,251,201,078,085
50550 :240,029,169,070,160,196,214
50556 :032,098,196,032,228,255,197
50562 :240,251,162,208,201,076,244
50568 :208,002,162,216,142,082,180
50574 :002,032,000,194,032,008,154
50580 :192,032,094,196,169,142,205
50586 :141,248,103,169,143,141,075
50592 :249,103,169,003,141,021,078
50598 :208,169,024,141,000,208,148
50604 :169,000,141,016,208,169,107
50610 :051,141,001,208,169,176,156
50616 :141,003,208,169,053,141,131
50622 :002,208,169,000,141,029,227
50628 :208,141,023,208,141,038,187
50634 :208,169,003,141,028,208,191
50640 :169,000,141,059,002,141,208
50646 :060,002,173,000,220,072,229
50652 :041,015,073,015,141,061,054
50658 :002,104,041,016,141,062,080
50664 :002,032,228,255,240,006,227
50670 :032,109,199,076,216,197,043
50676 :032,186,196,173,062,002,127
50682 :208,003,032,000,199,173,097
50688 :062,002,073,016,141,075,113
50694 :002,173,061,002,240,204,176
50700 :174,061,002,189,208,195,073
50706 :172,063,002,240,001,010,250
50712 :024,109,059,002,141,059,162
50718 :002,024,173,060,002,125,160
50724 :219,195,141,060,002,174,059
50730 :059,002,016,025,162,000,050
50736 :142,059,002,173,045,002,215
50742 :240,015,206,045,002,162,212
50748 :007,173,063,002,240,002,035
50754 :162,006,142,059,002,174,099
50760 :059,002,224,040,144,022,051
50766 :162,039,142,059,002,173,143
50772 :045,002,201,219,176,010,225
50778 :105,001,141,045,002,162,034
50784 :032,142,059,002,172,060,051
50790 :002,016,022,160,000,140,186
50796 :060,002,173,045,002,201,079
50802 :032,144,010,233,032,141,194
50808 :045,002,160,007,140,060,022
50814 :002,172,060,002,192,016,058
50820 :144,022,160,015,140,060,161
50826 :002,173,045,002,201,192,241
50832 :176,010,105,032,141,045,141
50838 :002,160,008,140,060,002,010
50844 :173,059,002,172,060,002,112
50850 :074,074,074,192,008,144,216
50856 :002,105,031,109,045,002,206
50862 :141,048,002,041,224,074,192
50868 :074,105,176,141,003,208,119
50874 :173,048,002,041,031,010,235
50880 :010,010,105,053,141,002,001
50886 :208,169,000,105,000,133,045
50892 :097,173,060,002,010,010,044
50898 :010,105,051,141,001,208,214
50904 :173,059,002,010,010,010,224
50910 :038,097,105,024,141,000,115
50916 :208,165,097,105,000,141,176
50922 :016,208,173,048,002,205,118
50928 :081,002,240,009,032,008,100
50934 :192,173,048,002,141,081,115
50940 :002,076,216,197,032,043,050
50946 :193,173,060,002,041,007,222
50952 :168,173,059,002,041,007,202
50958 :073,007,170,232,134,097,215
50964 :056,169,000,042,202,208,185
50970 :252,174,063,002,208,048,005
50976 :133,097,173,075,002,208,208
50982 :022,169,000,141,064,002,180
50988 :141,038,208,177,253,037,130
50994 :097,208,008,169,001,141,162
51000 :064,002,141,038,208,165,162
51006 :097,073,255,049,253,174,195
51012 :064,002,240,002,005,097,222
51018 :145,253,032,008,192,096,032
51024 :133,098,074,005,098,073,049
51030 :255,049,253,166,097,202,084
51036 :133,097,173,066,002,074,125
51042 :042,202,208,252,005,097,136
51048 :145,253,076,008,192,141,151
51054 :065,002,174,137,199,221,140
51060 :137,199,240,004,202,208,082
51066 :248,096,202,138,010,170,218
51072 :189,173,199,072,189,172,098
51078 :199,072,096,034,133,137,037
51084 :134,138,077,082,147,018,224
51090 :145,017,157,029,070,135,187
51096 :139,049,050,051,052,019,000
51102 :136,140,033,034,035,036,060
51108 :086,083,076,024,004,006,187
51114 :131,084,107,194,085,194,197
51120 :158,194,129,194,184,194,205
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51126 :215,194,025,195,071,193,051
51132 :248,199,014,200,036,200,061
51138 :058,200,082,200,117,200,027
51144 :160,200,172,200,172,200,024
51150 :172,200,172,200,189,200,059
51156 :214,200,236,200,014,201,253
51162 :014,201,014,201,014,201,095
51168 :085,201,136,202,020,203,047
51174 :036,203,160,203,051,194,053
51180 :239,199,152,193,162,255,156
51186 :154,032,129,255,076,200,064
51192 :196,173,060,002,041,007,215
51198 :133,097,056,173,060,002,007
51204 :233,008,056,229,097,141,000
51210 :060,002,076,078,200,173,087
51216 :060,002,041,007,133,097,100
51222 :024,173,060,002,105,008,138
51228 :056,229,097,141,060,002,101
51234 :076,078,200,173,059,002,110
51240 :041,007,133,097,056,173,035
51246 :059,002,233,008,056,229,121
51252 :097,141,059,002,076,078,249
51258 :200,173,059,002,041,007,028
51264 :133,097,024,173,059,002,040
51270 :105,008,056,229,097,141,194
51276 :059,002,104,104,076,041,206
51282 :198,032,043,193,032,019,087
51288 :193,160,007,024,165,254,123
51294 :105,096,141,106,200,165,139
51300 :253,141,105,200,185,000,216
51306 :208,145,253,136,016,248,088
51312 :032,031,193,076,008,192,132
51318 :169,016,141,063,002,169,166
51324 :001,141,029,208,032,008,031
51330 :192,173,058,002,009,008,060
51336 :141,058,002,032,092,193,142
51342 :169,050,141,065,002,032,089
51348 :173,200,173,059,002,041,028
51354 :254,141,059,002,076,078,252
51360 :200,169,000,141,063,002,223
51366 :141,029,208,032,008,192,008
51372 :096,056,173,065,002,233,029
51378 :049,141,066,002,170,189,027
51384 :003,192,141,038,208,096,094
51390 :173,059,002,013,060,002,243
51396 :208,003,141,045,002,169,252
51402 :000,141,059,002,141,060,093
51408 :002,032,008,192,076,078,084
51414 :200,032,072,193,032,072,047
51420 :193,032,043,193,160,000,073
51426 :177,253,153,067,002,200,054
51432 :192,008,208,246,096,032,246
51438 :043,193,160,000,185,067,118
51444 :002,145,253,200,192,008,020
51450 :208,246,076,008,192,144,100
51456 :005,028,159,156,030,031,153
51462 :158,129,149,150,151,152,127
51468 :153,154,155,169,035,160,070
51474 :196,032,098,196,032,228,032
51480 :255,240,251,162,000,221,129
51486 :255,200,240,008,232,224,165
51492 :016,208,246,076,094,196,104
51498 :056,173,065,002,233,033,092
51504 :168,138,153,003,192,192,126
51510 :003,240,010,192,000,240,227
51516 :019,153,033,208,076,080,117
51522 :201,174,063,002,240,002,236
51528 :009,008,141,058,002,032,066
51534 :092,193,032,008,192,076,159
51540 :094,196,169,122,160,201,002
51546 :032,098,196,032,228,255,163
51552 :056,233,048,048,248,201,162
51558 :010,176,244,133,097,056,050
51564 :169,009,229,097,010,010,120
51570 :010,010,141,076,002,076,173
51576 :094,196,067,085,082,083,215
51582 :079,082,032,086,069,076,038
51588 :079,067,073,084,089,032,044
51594 :040,048,045,057,041,063,176
51600 :095,160,000,140,078,002,107
51606 :169,164,032,210,255,169,125
51612 :157,032,210,255,032,228,046
51618 :255,240,251,172,078,002,136
51624 :133,097,169,032,032,210,073
51630 :255,169,157,032,210,255,228
51636 :165,097,201,013,240,039,167
51642 :201,020,208,013,192,000,052
51648 :240,209,136,169,157,032,111
51654 :210,255,076,147,201,041,104
51660 :127,201,032,144,194,192,070
51666 :020,240,190,165,097,153,051
51672 :000,002,032,210,255,200,147
51678 :076,147,201,169,095,153,039
51684 :000,002,152,096,032,231,229
51690 :255,169,007,160,196,032,029
51696 :098,196,032,228,255,240,009
51702 :251,162,001,201,084,240,161
51708 :011,162,008,201,068,240,174
51714 :005,104,104,076,094,196,069
51720 :141,077,002,160,001,169,046
51726 :001,032,186,255,169,025,170
51732 :160,196,032,149,196,032,017
51738 :145,201,208,007,173,077,069
51744 :002,201,084,208,237,173,169
51750 :077,002,201,068,208,066,148
51756 :169,064,141,020,002,169,097
51762 :048,141,021,002,169,058,233
51768 :141,022,002,160,000,185,054
51774 :000,002,153,023,002,200,186
51780 :204,078,002,208,244,169,205
51786 :044,153,023,002,169,080,033
51792 :153,024,002,173,065,002,243
51798 :201,083,208,012,169,044,035
51804 :153,025,002,169,087,153,169
51810 :026,002,200,200,200,200,158
51816 :200,200,200,076,124,202,082
51822 :160,000,185,000,002,153,098
51828 :020,002,200,204,078,002,110
51834 :208,244,152,162,020,160,044
51840 :002,032,189,255,169,160,167
51846 :133,178,096,032,232,201,238
51852 :032,043,203,169,000,133,208
51858 :253,133,251,169,112,133,173
51864 :252,162,255,160,119,169,245
51870 :251,032,216,255,176,011,075
51876 :032,183,255,208,006,032,112
51882 :075,203,076,094,196,032,078
51888 :075,203,032,231,255,173,121
51894 :077,002,201,068,240,015,017
51900 :169,244,160,195,032,098,062
51906 :196,032,228,255,240,251,116
51912 :076,094,196,169,000,032,255
51918 :189,255,169,015,162,008,236
51924 :160,015,032,186,255,032,124
51930 :192,255,162,015,032,198,048
51936 :255,160,000,032,207,255,109
51942 :201,013,240,007,153,000,076
51948 :002,200,076,227,202,169,088
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51954 :095,153,000,002,032,204,216
51960 :255,169,000,160,002,032,098
51966 :098,196,162,015,032,201,190
51972 :255,169,073,032,210,255,230
51978 :169,013,032,210,255,032,209
51984 :231,255,076,195,202,032,239
51990 :232,201,032,043,203,169,134
51996 :000,032,213,255,176,141,077
52002 :076,075,203,169,004,141,190
52008 :136,002,000,120,169,000,211
52014 :141,026,208,169,255,141,218
52020 :013,220,169,049,141,020,152
52026 :003,169,234,141,021,003,117
52032 :169,000,141,021,208,169,004
52038 :147,088,076,210,255,032,110
52044 :042,195,169,003,141,021,135
52050 :208,032,008,192,032,092,134
52056 :193,076,094,196,248,169,040
52062 :000,141,000,001,141,001,122
52068 :001,224,000,240,021,202,020
52074 :024,173,000,001,105,001,154
52080 :141,000,001,173,001,001,173
52086 :105,000,141,001,001,076,186
52092 :101,203,216,173,001,001,051
52098 :009,048,141,002,001,173,248
52104 :000,001,041,240,074,074,054
52110 :074,074,009,048,141,001,233
52116 :001,173,000,001,041,015,123
52122 :009,048,141,000,001,096,193
52128 :096,056,165,045,233,002,245
52134 :133,045,165,046,233,000,020
52140 :133,046,169,024,133,057,222
52146 :169,246,133,058,169,000,185
52152 :141,079,002,133,251,133,155

52158 :253,169,112,133,254,169,000
52164 :208,133,252,032,019,193,009
52170 :160,000,177,251,209,253,228
52176 :208,058,200,192,008,208,058
52182 :245,238,079,002,024,165,199
52188 :253,105,008,133,253,133,081
52194 :251,165,254,105,000,133,110
52200 :254,105,096,133,252,201,249
52206 :216,208,217,169,000,168,192
52212 :145,045,200,145,045,024,080
52218 :165,045,105,002,133,045,233
52224 :165,046,105,000,133,046,239
52230 :032,031,193,076,051,165,042
52236 :160,000,024,165,045,105,255
52242 :041,145,045,200,165,046,148
52248 :105,000,145,045,200,165,172
52254 :057,145,045,200,165,058,188
52260 :145,045,200,169,131,145,103
52266 :045,174,079,002,032,092,210
52272 :203,200,173,002,001,145,004
52278 :045,200,173,001,001,145,107
52284 :045,200,173,000,001,145,112
52290 :045,200,132,097,160,000,188
52296 :132,098,177,253,170,032,166
52302 :092,203,164,097,169,044,079
52308 :145,045,200,173,002,001,138
52314 :145,045,173,001,001,200,143
52320 :145,045,173,000,001,200,148
52326 :145,045,200,132,097,164,117
52332 :098,200,192,008,208,214,004
52338 :164,097,169,000,145,045,222
52344 :160,000,177,045,072,200,006
52350 :177,045,133,046,104,133,252
52356 :045,230,057,208,002,230,136
52362 :058,076,215,203,013,013,204
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Bonking Barrels

See article on page 50.

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1:

Bonking Barrels—VIC Version

```
12 PRINT"{CLR}"                          :rem 199
13 GOTO33                                 :rem 3
14 REM MAN JUMPS                         :rem 180
15 POKEE%,39:GOSUB19:POKEE%,37:POKES,P:P=
   P+3:POKEE%,38:GOSUB19                 :rem 95
16 IFPEEK(E%-22)=LLTHEN77                :rem 217
17 POKEE%,32:E%=E%-22:POKEE%,38:POKES,0:P
   OKEE%,32:E%=E%-22:POKEE%,38:RETURN
                                         :rem 180
18 REM MOVE BARRELS                      :rem 143
19 POKES,O                               :rem 103
20 FORX=1TOZ%:POKEB%(X),C                 :rem 25
21 IFPEEK(B%(X)+I%)=WTHENB%(X)=B%(X)+D(X)
                                          :rem 73
22 IFPEEK(B%(X))=WTHENB%(X)=B%(X)-T%*D(X)
                                         :rem 86
23 IFPEEK(B%(X)+I%)<>WTHENB%(X)=B%(X)+I%
                                          :rem 9
24 IFPEEK(B%(X))>36ANDPEEK(B%(X))<40THEN7
   7                                     :rem 184
25 POKEB%(X),LL                          :rem 106
26 IFB%(X)>JTHENGOSUB29                  :rem 169
27 NEXTX:RETURN                           :rem 26
28 REM RESET BARRELS                     :rem 220
29 FORX=1TOZ%:POKEB%(X),C:B%(X)=SR+INT(RN
   D(X)*T%):NEXTX                        :rem 182
30 REM SCORE                              :rem 2
31 PRINT"{HOME}";SPC(242);SPC(244);"{RVS}
   SCORE{4 SPACES}{4 LEFT}"SC;"{9 SPACES}
   {6 LEFT}";                            :rem 221
32 FORQ=3TOA+1STEP-1:PRINT"{OFF}%";:NEXT:
   PRINT"{HOME}":RETURN                  :rem 149
33 SR=7681:K=38400-SR+1                   :rem 13
34 POKE36879,14                           :rem 56
35 POKE36869,255                         :rem 111
36 BL$="{RVS}{YEL}{22 SPACES}"            :rem 76
37 AL$= "{OFF}{PUR}$$$$$$$$$$$$$$$$$$$$$$
   "                                     :rem 226
38 J=SR+449:V=36878:S=36876               :rem 24
39 FORI=7424TO7424+8*8-1:READA:POKEI,A:NE
   XT:GOSUB91                            :rem 148
40 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,56
   ,108,206,174,234,230,108,56:REM BARREL
                                         :rem 178
41 DATA56,108,246,250,134,222,108,56:REM
   {SPACE}BARREL                         :rem 242
42 DATA255,153,189,153,255,0,0,0:REM BEAM
                                         :rem 131
43 DATA56,56,16,56,84,16,56,40:REM MAN NO
   RMAL                                  :rem 194
44 DATA186,186,84,56,16,16,56,40,0,0,0,0,56
   ,56,16,124,170:REM MAN STRETCHING,SQUA
   TING                                   :rem 81
45 PRINT"{CLR}":A=0:SC=0:Z%=4             :rem 28
```

```
46 REM SET UP SCREEN                    :rem 159
47 PRINT"{HOME}";:BL=60                 :rem 245
48 FORI=1TO10:PRINTBL$;AL$;:NEXT:PRINTBL$
   ;BL$;"{HOME}"                        :rem 31
49 X=SR+21:POKEV,15                     :rem 134
50 FORB=1TOBL                           :rem 45
51 R=INT(RND(X)*454)                    :rem 133
52 POKEX+R,32:POKES-1,195+B:POKEX+R+K,7:N
   EXTB                                 :rem 32
53 FORG=-1TO20STEP1                     :rem 163
54 POKEX+G*22,36:POKES-1,200+(G*2):POKEX+
   G*22+K,5                             :rem 20
55 POKEX+21+(G*22),36:POKES-1,0:POKEX+21+
   (G*22)+K,5:NEXTG                     :rem 18
56 REM PREP FOR LOOP                    :rem 167
57 E%=J:D(1)=1:D(2)=-1:D(3)=1:D(4)=-1:L=1
   :LM=17:RM=18:UP=47:BM=39             :rem 89
58 O=0:W=36:C=32:KB=197:T%=20:I%=22:LL=34
   :D=37:Z=245:P=128:TT%=1:TH%=3:GOSUB29
                                        :rem 45
59 REM MAIN GAME LOOP                   :rem 203
60 GOSUB19                              :rem 80
61 IFPEEK(E%)=LLTHENE%=E%+22:POKEE%+K,7:P
   OKEE%+I%,36:POKEE%+I%+K,4:GOTO77
                                        :rem 74
62 IFPEEK(E%-I%)=LLTHEN77               :rem 228
63 IFPEEK(E%+I%)=LLTHENPOKEE%,C:E%=E%+44:
   GOTO77                               :rem 60
64 IFLL=34THENLL=35:GOTO66              :rem 128
65 LL=34                                :rem 167
66 POKEE%,C                             :rem 116
67 IFPEEK(KB)=LMTHENIFPEEK(E%-L)<>WTHENE%
   =E%-L:GOSUB110:POKEE%,D:GOTO71:rem 224
68 IFPEEK(KB)=RMTHENIFPEEK(E%+L)<>WTHENE%
   =E%+L:GOSUB110:POKEE%,D:GOTO71:rem 227
69 IFPEEK(KB)=BMTHENIFPEEK(E%-I%)=WTHENPO
   KEE%-I%,C:SC=SC-5:P=P-10:GOTO71
                                        :rem 241
70 IFPEEK(KB)=UPTHENIFPEEK(E%-I%)<>WTHENG
   OSUB15:SC=SC+2*L:P=P+3:POKEE%,D:rem 40
71 IFF=1THENF=0:GOTO77                  :rem 110
72 POKEE%,D:POKES,P:IFP<128OR P>200THENP=
   128                                  :rem 178
73 IF E%<SRTHENE%=J:TT%=TT%+L:GOSUB31:IFS
   C>35THENZ%=RND(X)*4+1                :rem 65
74 IFTT%>TH%THENGOTO47                  :rem 153
75 GOTO60                               :rem 11
76 REM LOSE MAN                         :rem 96
77 N=15:POKES+1,235:POKEV,N:FORQ=1TO4:POK
   EB%(Q),32:NEXT                       :rem 169
78 POKEE%,38:POKEE%-22,34:GOSUB103:POKEE%
   ,37:GOSUB103:POKEE%,39:GOSUB103:rem 84
79 POKEE%-22,194:POKEE%,35:GOSUB103:POKEE
   %+1,173:POKEE%-1,173:POKEE%+22,194
                                        :rem 51
80 POKEE%-21,206:POKEE%-23,205:POKEE%+23,
   205:POKEE%+21,206:GOSUB103           :rem 22
81 POKEE%-66,174:POKEE%-2,174:POKEE%+2,17
   4:POKEE%+66,174:GOSUB103:POKEE%-42,174
                                        :rem 3
82 POKEE%-46,174:POKEE%+42,174:POKEE%+46,
   174:GOSUB103                         :rem 12
83 POKE36877,0:A=A+1:SC=SC-8:GOSUB31
                                        :rem 128
84 TT%=1:IFA<3GOTO47                    :rem 196
85 PRINT"{CLR}{4 DOWN}{RVS}{6 SPACES}GAME
    OVER"                               :rem 125
86 PRINT"{RVS}{DOWN} PRESS P PLAY AGAIN":
   PRINT"{RVS}{DOWN}{4 SPACES}PRESS E TO
   {SPACE}END";                         :rem 138
87 GETYY$:IFYY$="P"THEN 45              :rem 45
88 IF YY$="E" THEN PRINT"{CLR}":POKE36869
   ,240:END                             :rem 122
89 GOTO87                               :rem 25
90 REM                                  :rem 77
91 PRINT"{CLR}{3 DOWN}{4 RIGHT}{RVS}{YEL}
   *INSTRUCTIONS*"                      :rem 46
92 PRINT"{RVS}{DOWN}{5 RIGHT}A IS LEFT":P
   RINT"{RVS}{5 RIGHT}D IS RIGHT":PRINT"
   {RVS}{4 RIGHT}F3 IS UP"              :rem 79
93 PRINT"{RVS}{4 RIGHT}F1 WILL BLAST
   {12 SPACES}SPACE ABOVE "             :rem 193
94 PRINT"{RVS}{DOWN}{4 RIGHT}2 FOR EACH U
   P":PRINT"{RVS}{3 RIGHT}-5 FOR USING BL
   AST"                                 :rem 93
95 PRINT"{RVS}{3 RIGHT}-8 FOR GETTING HIT
   "                                    :rem 235
96 PRINT "{RVS}{DOWN}{3 RIGHT}{DOWN}PRESS
    SPACE BAR{CYN}"                     :rem 56
97 IFPEEK(197)<>32THEN97                :rem 148
100 RETURN                              :rem 113
102 REM TIME AND SOUND FOR LOSE MAN ROUTI
   NE                                   :rem 30
103 N=N-2:IFN<0THENN=0                  :rem 57
104 POKEV,N:IFPEEK(E%)=38ORPEEK(E%)=39THE
   NFORQ=1TO200:NEXT                    :rem 146
105 FORQ=1TO50:NEXT:RETURN              :rem 215
110 IFPEEK(E%)<>34ANDPEEK(E%)<>35THENRETU
   RN                                   :rem 134
111 F=1:RETURN                          :rem 97
```

Program 2:

Bonking Barrels—64 Version

```
100 PRINT"{CLR}{CYN}{3 DOWN}{7 SPACES}RED
    EFINING CHARACTER SET"              :rem 27
110 GOTO390                             :rem 103
120 REM MAN JUMPS                       :rem 226
130 POKEE%,39                           :rem 197
140 FOR X=1TOZ%:GOSUB250:IF PEEK(B%(X))>3
    6ANDPEEK(B%(X))<40 THEN910          :rem 109
145 IF PEEK(B%(X)+D(X))>36ANDPEEK(B%(X)+D
    (X))<40THEN910                      :rem 72
147 IF PEEK(B%(X)-1)>36ANDPEEK(B%(X)-1)<4
    0THEN910                            :rem 214
150 GOSUB 310:NEXTX                     :rem 123
160 POKEE%,37                           :rem 198
170 POKES,P                             :rem 150
180 P=P+3                               :rem 212
190 POKEE%,38                           :rem 202
200 FORX=1TOZ%:GOSUB250:IF PEEK(B%(X))>36
    ANDPEEK(B%(X))<40 THEN910           :rem 106
203 IF PEEK(B%(X)+D(X))>36ANDPEEK(B%(X)+D
    (X))<40THEN910                      :rem 67
205 IF PEEK(B%(X)-1)>36ANDPEEK(B%(X)-1)<4
    0THEN910                            :rem 209
210 GOSUB 310:NEXTX                     :rem 120
220 IFPEEK(E%-40)=LLTHEN 910            :rem 50
230 POKEE%,32:E%=E%-40:POKEE%,38:POKES,0:
    POKEE%,32:E%=E%-40:POKEE%,38:RETURN
                                        :rem 225
240 REM MOVE BARRELS                    :rem 188
250 POKES+1,O                           :rem 240
260 POKEB%(X),C                         :rem 70
270 IFPEEK(B%(X)+I%)=WTHENB%(X)=B%(X)+D(X
    )                                   :rem 127
280 IFPEEK(B%(X))=WTHENB%(X)=B%(X)-T%*D(X
    )                                   :rem 140
290 IFPEEK(B%(X)+I%)<>WTHENB%(X)=B%(X)+I%
                                        :rem 63
300 RETURN                              :rem 115
```

```
310 POKEB%(X),LL                        :rem 151
320 IFB%(X)>JTHENGOSUB350               :rem 3
330 RETURN                              :rem 118
340 REM RESET BARRELS                   :rem 9
350 FORX=1TOZ%:POKEB%(X),C:B%(X)=SR+INT(R
    ND(X)*T%):NEXTX                     :rem 227
360 REM SCORE                           :rem 249
370 PRINT"{HOME}{23 DOWN}{RVS}SCORE
    {4 SPACES}{4 LEFT}"SC;"{9 SPACES}
    {6 LEFT}";                          :rem 5
380 FORQ=3TOA+1STEP-1:PRINT"{OFF}%";:NEXT
    :PRINT"{HOME}":RETURN               :rem 203
390 POKE53281,0:POKE53280,6             :rem 247
400 POKE56,48:CLR                       :rem 225
410 POKE56334,PEEK(56334)AND254:POKE1,PEE
    K(1)AND251                          :rem 182
420 BL$="{RVS}{YEL}{40 SPACES}"         :rem 121
430 AL$="{OFF}{PUR}$$$$$$$$$$$$$$$$$$$$
    $$$$$$$$$$$$$$$$$$$"                :rem 151
440 FORI=0TO1023:POKEI+12288,PEEK(I+53248
    ):POKEI+13312,PEEK(I+53248):NEXT
                                        :rem 8
450 POKE1,PEEK(1)OR4                    :rem 161
460 POKE56334,PEEK(56334)OR1            :rem 71
470 POKE53272,(PEEK(53272)AND240)+12
                                        :rem 186
480 FORI=12544TO12544+8*8-1:READA:POKEI,A
    :NEXT:GOSUB1080                     :rem 129
490 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
    56,108,206,174,234,230,108,56       :rem 21
500 DATA56,108,246,250,134,222,108,56:REM
     BARREL                             :rem 34
510 DATA255,153,189,153,255,0,0,0:REM BEA
    M                                   :rem 179
520 DATA56,56,16,56,84,16,56,40:REM MAN N
    ORMAL                               :rem 242
530 DATA186,186,84,56,16,16,56,40,0,0,0,5
    6,56,16,124,170                     :rem 244
540 SR=1025:K=55296-SR+1                :rem 62
550 J=SR+820:V=54296:S=54272:FORI=STOV:PO
    KEI,0:NEXTI                         :rem 243
560 POKEV,15:POKES+5,130:POKES+6,72
                                        :rem 64
570 SR=1025:K=55296-SR+1                :rem 65
580 PRINT"{CLR}":A=0:SC=0:Z%=4          :rem 80
590 REM SET UP SCREEN                   :rem 211
600 PRINT"{CLR}";:BL=80                 :rem 162
610 FORI=1TO10:PRINTBL$;AL$;:NEXT:PRINTBL
    $;BL$;"{HOME}"                      :rem 74
620 X=SR+39:POKES+4,33:POKES+24,15
                                        :rem 245
630 FORB=1TOBL                          :rem 97
640 R=INT(RND(X)*908)                   :rem 189
650 POKEX+R,32:POKEX+R+K,7:POKES+1,B+10:N
    EXT:POKES+4,0                       :rem 73
660 POKES+4,17:FORG=-1TO20              :rem 25
670 POKEX+G*40,36:POKES+1,50+(G*2):POKEX+
    G*40+K,5                            :rem 25
680 POKEX+39+(G*40),36:POKES+1,0:POKEX+39
    +(G*40)+K,5:NEXTG:POKES+4,0         :rem 205
690 REM PREP FOR LOOP                   :rem 219
700 E%=J:D(1)=1:D(2)=-1:D(3)=1:D(4)=-1:L=
    1:LM=10:RM=18:UP=5:BM=4:O=0         :rem 5
710 W=36:C=32:KB=197:T%=38:I%=40:LL=34:D=
    37:Z=245:P=128:TT%=1:TH%=3:GOSUB350
                                        :rem 152
720 REM MAIN GAME LOOP                  :rem 246
730 FOR X=1TOZ%:GOSUB250:IFPEEK(B%(X))>36
    ANDPEEK(B%(X))<40 THEN910           :rem 114
735 IF PEEK(B%(X)+D(X))>36ANDPEEK(B%(X)+D
    (X))<40THEN910                      :rem 77
737 REM{3 SPACES}IF PEEK(B%(X)-1)>36ANDPE
    EK(B%(X)-1)<40THEN910               :rem 191
740 GOSUB 310:NEXTX                     :rem 128
750 IFPEEK(E%)=LLTHENE%=E%+40:POKEE%+K,7:
    POKEE%+I%,36:POKEE%+I%+K,4:GOTO910
                                        :rem 171
760 IFPEEK(E%-I%)=LLTHEN910             :rem 69
770 IFPEEK(E%+I%)=LLTHENPOKEE%,C:E%=E%+80
    :GOTO910                            :rem 157
780 IFLL=34THENLL=35:GOTO800            :rem 225
790 LL=34                               :rem 220
800 POKEE%,C                            :rem 160
810 IFPEEK(KB)=LMTHENIFPEEK(E%-L)<>WTHENE
    %=E%-L:POKEE%,D:YG=-2:GOTO850:rem 107
820 IFPEEK(KB)=RMTHENIFPEEK(E%+L)<>WTHENE
    %=E%+L:POKEE%,D:YG=2:GOTO850        :rem 65
830 IFPEEK(KB)=BMTHENIFPEEK(E%-I%)=WTHENP
    OKEE%-I%,C:SC=SC-5:P=P-10           :rem 66
840 IFPEEK(KB)=UPTHENIFPEEK(E%-I%)<>WTHEN
    GOSUB130:SC=SC+L+L:P=P+3:POKEE%,D
                                        :rem 166
850 IFP>ZTHENP=128                      :rem 107
860 POKEE%,D:POKES+4,17:POKES+1,40
                                        :rem 254
870 IF E%<SRTHENE%=J:TT%=TT%+L:GOSUB370:I
    FSC>35THENZ%=RND(X)*4+1             :rem 172
880 IFTT%>TH%THENGOTO600                :rem 249
890 GOTO730                             :rem 116
900 REM LOSE MAN                        :rem 140
910 POKES+4,129:N=15:POKES,39:POKES+1,09:
    FORQ=1TO4:POKEB%(Q),32:NEXT         :rem 162
920 POKEE%,38:POKEE%-40,34:GOSUB1190:POKE
    E%,37:GOSUB1190:POKEE%,39:GOSUB1190
                                        :rem 37
930 POKEE%-40,194:POKEE%,35:GOSUB1190:POK
    EE%+1,173:POKEE%-1,173:POKEE%+40,194
                                        :rem 150
940 POKEE%-39,206:POKEE%-41,205         :rem 187
950 POKEE%+41,205:POKEE%+39,206:GOSUB1190
                                        :rem 61
960 POKEE%-120,174:POKEE%-2,174:POKEE%+2,
    174:POKEE%+120,174:GOSUB1190        :rem 144
970 POKEE%-78,174                       :rem 157
980 POKEE%-82,174:POKEE%+78,174:POKEE%+82
    ,174:GOSUB1190                      :rem 131
990 SC=SC-8:POKES+4,128:A=A+1:GOSUB370
                                        :rem 251
1000 TT%=1:IFA<3GOTO600                 :rem 68
1010 PRINT"{CLR}{9 RIGHT}{9 DOWN}";
                                        :rem 255
1015 POKE198,0:PRINT"{RVS}{6 SPACES}GAME
     {SPACE}OVER"                       :rem 103
1018 PRINT"{DOWN}{RVS}{14 SPACES}SCORE= "
     ;SC                                :rem 72
1020 PRINT"{RVS}{DOWN}{6 SPACES}HIT SPACE
      BAR TO PLAY AGAIN"                :rem 22
1030 PRINT"{RVS}{DOWN}{10 SPACES}ANY OTHE
     R KEY TO END"                      :rem 133
1040 GETYY$:IFYY$=""THEN1040            :rem 143
1050 IF YY$<>" "THEN PRINT"{CLR}":END
                                        :rem 141
1060 GOTO580                            :rem 157
1070 REM                                :rem 172
1080 PRINT"{CLR}{3 DOWN}":PRINTTAB(11)"*I
     NSTRUCTIONS*":PRINT                :rem 197
1090 PRINTTAB(9)"{RVS}A{OFF} MOVES MAN LE
     FT":PRINTTAB(9)"{RVS}D{OFF} MOVES MA
     N RIGHT"                           :rem 170
1100 PRINT:PRINTTAB(9)"{RVS}F3{OFF} MOVES
      MAN UP 1 LEVEL"                   :rem 140
```

```
1110 PRINTTAB(9)"{RVS}F1{OFF} WILL BLAST
     {SPACE}SPACE ABOVE"          :rem 151
1120 PRINT:PRINTTAB(9)"{3 SPACES}**POINTS
     **"                          :rem 66
1130 PRINT:PRINTTAB(9)"2 FOR EACH UP":PRI
     NTTAB(8)"-5 FOR USING BLAST" :rem 61
1140 PRINTTAB(8)"-8 FOR GETTING HIT"
                                  :rem 58
1150 PRINT"{3 DOWN}":PRINTTAB(8)"
     {3 SPACES}PRESS SPACE BAR{CYN}"
                                  :rem 163
1160 GETXX$:IFXX$=""THEN1160      :rem 145
1170 RETURN                       :rem 169
1180 REM TIME AND SOUND FOR LOSE MAN ROUT
     INE                          :rem 85
1190 N=N-2:IFN<0THENN=0           :rem 112
1200 IFPEEK(E%)=38ORPEEK(E%)=39THENFORQ=1
     TO50:NEXT                    :rem 90
1210 FORQ=1TO25:NEXT:RETURN        :rem 7
```

Space Patrol

See article on page 52.

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1:

Space Patrol—VIC Version, Loader Program

```
5 PRINT"{CLR}{7 DOWN}{2 SPACES}{RVS}** SP
  ACE PATROL **{8 DOWN}"          :rem 144
11 PRINT"PLEASE WAIT WHILE ":PRINT"PROGRA
   M LOADS..."                    :rem 187
15 POKE 52,27:POKE56,27           :rem 250
20 FORI=7168TO7679:POKEI,PEEK(I+25600):NE
   XT                             :rem 99
30 READX:IFX<0THEN45              :rem 252
35 FORI=XTOX+7:READJ:POKEI,J:NEXT:GOTO30
                                  :rem 161
45 S$="LO"+CHR$(34)+"SP"+CHR$(34)+",8:"+C
   HR$(131)                       :rem 117
50 FOR I=1 TO LEN(S$):POKE630+I,ASC(MID$(
   S$,I)):NEXT:POKE 198,I:END     :rem 92
800 PRINT"{HOME}":NEW:CLR:END     :rem 204
1000 DATA7384,0,0,0,63,95,255,0,0:rem 116
1001 DATA7392,2,6,14,254,254,255,240,60
                                  :rem 172
1002 DATA7400,64,96,112,127,127,255,15,60
                                  :rem 17
1003 DATA7408,0,0,0,252,250,255,0,0
                                  :rem 205
1004 DATA7416,0,0,60,126,171,126,60,0
                                  :rem 56
1005 DATA7432,0,16,84,16,254,16,84,16
                                  :rem 79
1006 DATA7440,0,146,16,56,254,56,16,146
                                  :rem 181
1007 DATA7448,64,96,112,95,64,255,19,62
                                  :rem 204
1008 DATA7456,0,0,0,248,12,255,0,0
                                  :rem 166
1009 DATA7464,0,0,0,31,48,255,0,0:rem 117
1010 DATA7472,2,6,14,250,2,255,200,124
                                  :rem 107
1011 DATA7480,0,0,0,0,0,126,0,0   :rem 249
1012 DATA7488,127,204,200,126,6,14,28,255
                                  :rem 21
1013 DATA7496,254,51,19,126,96,112,56,255
                                  :rem 39
1014 DATA7504,0,0,2,3,15,31,63,255
                                  :rem 164
1015 DATA7512,1,3,7,15,159,255,255,255
                                  :rem 132
1016 DATA7520,0,128,192,192,224,227,247,2
     55                           :rem 127
1017 DATA7528,0,4,14,63,255,255,255,255
                                  :rem 187
1018 DATA7536,4,6,15,191,255,255,255,255
                                  :rem 244
1019 DATA7544,0,48,242,255,255,255,255,25
     5                            :rem 89
1020 DATA7632,0,0,0,129,195,231,255,255
                                  :rem 168
1021 DATA7640,32,112,248,252,254,255,255,
     255                          :rem 174
1022 DATA7648,0,0,0,32,112,248,252,255
                                  :rem 116
1023 DATA7168,255,255,255,255,255,255,255
     ,255                         :rem 246
1024 DATA7656,0,4,14,14,14,4,14,10
                                  :rem 166
1025 DATA7664,0,0,0,0,0,0,0,0     :rem 153
1026 DATA6913,166,47,134,95,166,48,134,96
                                  :rem 52
1027 DATA6921,160,0,177,95,201,204,240,12
                                  :rem 12
1028 DATA6929,24,101,95,133,95,144,2,230
                                  :rem 234
1029 DATA6937,96,76,9,27,96,0,0,0:rem 156
1030 DATA6945,0,0,0,0,32,148,224,165
                                  :rem 12
1031 DATA6953,142,56,229,11,176,252,101,1
     1                            :rem 66
1032 DATA6961,133,11,96,0,24,32,148,209
                                  :rem 177
1033 DATA6969,160,0,177,88,208,58,162,22
                                  :rem 249
1034 DATA6977,134,93,162,30,134,94,166,14
     2                            :rem 88
1035 DATA6985,16,16,162,9,134,11,32,37
                                  :rem 136
1036 DATA6993,27,169,12,24,101,11,133,11
                                  :rem 222
1037 DATA7001,144,7,162,10,134,11,32,37
                                  :rem 160
1038 DATA7009,27,165,93,24,101,11,133,93
                                  :rem 228
1039 DATA7017,160,1,145,88,144,2,230,94
                                  :rem 181
1040 DATA7025,165,94,136,145,88,76,163,27
                                  :rem 42
1041 DATA7033,177,88,133,94,200,177,88,13
     3                            :rem 88
1042 DATA7041,93,160,22,177,93,201,32,208
                                  :rem 17
1043 DATA7049,41,169,32,160,0,145,93,165
                                  :rem 233
1044 DATA7057,93,24,105,22,133,93,200,145
                                  :rem 17
1045 DATA7065,88,136,144,6,230,94,165,94
                                  :rem 250
1046 DATA7073,145,88,169,31,145,93,165,94
                                  :rem 51
```

```
1047 DATA7081,24,105,120,133,94,169,7,145
                                        :rem 26
1048 DATA7089,93,96,48,253,169,32,160,0
                                        :rem 204
1049 DATA7097,145,93,169,0,145,88,200,145
                                        :rem 43
1050 DATA7105,88,141,0,27,76,178,27,0
                                        :rem 82
1051 DATA7113,0,32,1,27,160,1,177,95
                                        :rem 17
1052 DATA7121,201,128,240,6,32,9,27,76
                                        :rem 123
1053 DATA7129,205,27,173,0,27,133,11,32
                                        :rem 168
1054 DATA7137,37,27,230,11,165,11,141,0
                                        :rem 164
1055 DATA7145,27,32,53,27,173,0,27,240
                                        :rem 127
1056 DATA7153,7,133,11,230,11,32,53,27
                                        :rem 115
1057 DATA7161,96,0,0,0,0,0,255,255
                                        :rem 173
1058 DATA -1                            :rem 70
```

Program 2:

Space Patrol—VIC Main Program

```
30 C=30720:V=36878:S1=36875:S2=S1+1:S3=S1
   +2:HS=7664:HI=PEEK(HS)*256+PEEK(HS+1)
                                        :rem 223
40 DD=37154:DIML%(13):POKE36879,9:GOSUB70
   0:POKE36869,255                      :rem 216
50 PRINT"{CLR}{WHT}{RVS}SC=0{6 SPACES}HI=
   0{5 SPACES}#{HOME}"                  :rem 23
55 P=7976:D=0:DI=1:BA=20:OP=5:SC=0:BO=0:G
   =7723:C$="{HOME}{21 DOWN}"           :rem 59
60 FORI=38410TO38850STEP22:POKEI,1:POKEI+
   1,1:NEXT:FORI=38443TO38861STEP22:POKEI
   ,5:NEXT                              :rem 151
65 GOSUB380:GOSUB850:PRINTC$;A$;"{CYN}@@@
   @@@@@@@@@@@@@@@@{HOME}":POKEP,27:POK
   EP+1,28                              :rem 21
70 POKE38905,3:POKE8185,0:GOSUB850:FORT=1
   TO6:GOSUB900:NEXT                    :rem 120
75 FORH=1TO5-U                          :rem 99
76 POKE7420,204:POKE37139,0:POKEDD,127:J=
   PEEK(37152)AND128:J3=-(J=.):POKEDD,255
                                        :rem 53
90 J=PEEK(37137):J1=-((JAND8)=.):J2=-((JA
   ND16)=.):J0=-((JAND4)=.):FR=-((JAND32)
   =.)                                  :rem 228
95 IFFRANDDI=1THEN400                   :rem 38
99 POKE7420,179                         :rem 59
100 IFJ1THEN265                         :rem 103
105 IFJ2THEN220                         :rem 100
110 IFJ3THEN200                         :rem 95
115 IFJ0THEN255                         :rem 107
120 NEXT:GOSUB900:GOTO75                :rem 4
200 D=1:POKEP,32:POKEP+1,32:GOSUB300:A$=M
   ID$(A$,2,26)+MID$(A$,1,1):GOTO250
                                        :rem 166
220 D=0:POKEP,32:POKEP+1,32:GOSUB300:A$=M
   ID$(A$,27,1)+MID$(A$,1,26)           :rem 212
250 PRINTC$;A$"{HOME}":GOTO120          :rem 136
255 POKEP,32:POKEP+1,32:P=P-22:IFP<7712TH
   ENP=P+22                             :rem 187
260 GOSUB300:GOTO120                    :rem 177
265 POKEP,32:POKEP+1,32:P=P+22:IFP>8130TH
   ENP=P-22                             :rem 185
275 GOSUB300                            :rem 177
280 IF(P=8130)ANDPEEK(P+22)=40ANDPEEK(P+2
   3)=41ANDDI=0THENGOSUB350:DI=1:GOSUB30
   0                                    :rem 253
285 GOTO250                             :rem 111
300 IFD=.THEN315                        :rem 153
305 IFDI=.THENPOKEP,35:POKEP+1,36:RETURN
                                        :rem 37
310 POKEP,29:POKEP+1,30:RETURN          :rem 104
315 IFDI=.THENPOKEP,37:POKEP+1,38:RETURN
                                        :rem 42
320 POKEP,27:POKEP+1,28:RETURN          :rem 110
350 POKEV,15:GOSUB855:FORT=150TO250:POKES
   1,T:POKES2,T:NEXT                    :rem 225
370 BA=BA-6+U:IFBA<5THENBA=5            :rem 161
380 B=BA:G=8163-BA*22:FORT=GTO8141STEP22:
   POKET,61:NEXT                        :rem 62
385 POKEV,0:POKES1,0:POKES2,0:RETURN
                                        :rem 46
400 POKEV,15:POKES2,245:IFD=.THEN430
                                        :rem 158
410 F=P+2                               :rem 197
415 IFF=P+11THEN493                     :rem 88
420 IFPEEK(F)=31THEN460                 :rem 75
425 POKEF+C,1:POKEF,39:FORT=1TO1:NEXT:POK
   EF,32:F=F+1:GOTO415                  :rem 254
430 F=P-1                               :rem 200
435 IFF=P-11THEN493                     :rem 92
440 IFPEEK(F)=31THEN460                 :rem 77
445 POKEF+C,1:POKEF,39:FORT=1TO1:NEXT:POK
   EF,32:F=F-1:GOTO435                  :rem 4
460 X=0:FORT=0TO13:IFL%(T)=FTHENX=T:L%(T)
   =0                                   :rem 127
470 NEXT:POKES3,200:FORT=15TOOSTEP-5:POKE
   F+C,7:POKEF,33:POKEV,T:POKEF+C,2:POKE
   F,34:NEXT                            :rem 101
480 POKES3,0:POKEF,32:SC=SC+2+U*4:BO=BO+2
   +U*4                                 :rem 159
485 IFBO>500THEN:GOSUB500:OP=OP+1:BO=BO-5
   00:GOSUB855                          :rem 218
490 PRINT"{HOME}{WHT}{RVS}"TAB(3)SC
                                        :rem 137
493 B=B-1:IFB=0THENDI=0:GOSUB300        :rem 173
498 POKEG,32:G=G+22:POKEV,0:POKES2,0:GOTO
   120                                  :rem 171
500 POKEV,15:FORT=1TO28:PRINT"{HOME}
   {DOWN}{WHT}";MID$("{18 SPACES}[£''BO
   NUS ",T,22):POKES2,230               :rem 233
510 FORY=1TO85:NEXTY,T:POKEV,0:POKES2,0:R
   ETURN                                :rem 37
700 POKE36869,240:PRINT"{CLR}{5 DOWN}
   {2 RIGHT}{RVS}{YEL}** SPACE PATROL **
   "                                    :rem 91
710 PRINT"{GRN}{6 DOWN}{4 RIGHT}EASY
   {5 RIGHT}HARD"                       :rem 67
715 PRINT"{DOWN}{4 RIGHT}{RVS}{WHT}1{OFF}
   ..{RVS}2{OFF}..{RVS}3{OFF}..{RVS}4
   {OFF}..{RVS}5{OFF}"                  :rem 155
720 GETW$:IFW$=""THEN720                :rem 129
725 U=VAL(W$):IFU<1ORU>5THEN720         :rem 155
730 Q%=14-2*U:RETURN                    :rem 170
850 PRINT"{HOME}{WHT}{RVS}"TAB(13)HI
                                        :rem 181
855 A$="{CYN}/:;<{WHT}(){CYN}*+,-./:;<
   {WHT}(){CYN}*+,-."                   :rem 137
860 PRINT"{HOME}{WHT}{RVS}"TAB(20)OP:RETU
   RN                                   :rem 220
900 POKE6912,Q%:SYS7114:IFPEEK(6912)=0THE
   N950                                 :rem 141
910 RETURN                              :rem 122
950 OP=OP-1:GOSUB860                    :rem 207
960 POKEV,15:FORT=1TO15:POKES2,250:FORY=1
   TO5:NEXT:POKES2,0:NEXT:POKEV,0:rem 106
```

```
985 IFOP<>0THENRETURN                :rem 141
990 POKEV,15:FORT=8TO15:POKE36879,25:FORY
    =200TO220+T*2:POKES2,Y:NEXT:POKE36879
    ,9:NEXT                          :rem 88
1000 POKES0,0:POKES2,0:PRINT"{HOME}
    {5 DOWN}"TAB(4)"{WHT}◆◆◆◆◆◆◆◆◆◆◆◆"
                                     :rem 4
1005 PRINTTAB(4)"◆ GAME OVER ◆":PRINTTAB(
    4)"◆◆◆◆◆◆◆◆◆◆◆◆"                :rem 65
1006 PRINT"{3 DOWN}"TAB(5)"{WHT}HIT ANY K
    EY"                              :rem 39
1010 IFSC>HITHENHI=SC:GOSUB850       :rem 160
1020 POKE7420,204:FORY=1TO80:NEXT:POKE742
    0,51:FORY=1TO80:NEXT             :rem 33
1025 GETW$:IFW$=""THEN1020           :rem 218
1040 POKEHS,INT(HI/256):POKEHS+1,(HI/256-
    INT(HI/256))*256                 :rem 27
1050 RUN                             :rem 187
```

Program 3:

Space Patrol—64 Version

```
10 DIM L%(12)                        :rem 96
20 BA=20:SC=0:BI=20:BL=500           :rem 191
30 SO=32768:VO=53248:MF=49530:S=54272
                                     :rem 75
40 GOSUB1570                         :rem 177
50 OP=5:POKEMF+0,1                   :rem 42
60 IFPEEK(MF+6)=.THEN90              :rem 98
70 POKEMF+6,0:IFDITHENPOKESO+1016,PEEK(SO
   +1016)-2:DI=0:GOTO90              :rem 213
80 A$=RIGHT$(A$,1)+LEFT$(A$,49):POKE214,2
   2:PRINT:PRINT"{WHT}"LEFT$(A$,40);
                                     :rem 191
90 IFPEEK(MF+7)=.THEN120             :rem 144
100 POKEMF+7,0:IFDI=.THENPOKESO+1016,PEEK
    (SO+1016)+2:DI=1:GOTO120         :rem 148
110 A$=RIGHT$(A$,49)+LEFT$(A$,1):POKE214,
    22:PRINT:PRINT"{WHT}"LEFT$(A$,40);
                                     :rem 233
120 IFPEEK(MF+4)=.THENPOKEMF+4,HF:SYS4938
    9                                :rem 73
130 IFPEEK(MF+8)THENGOSUB940:POKEMF+8,0
                                     :rem 150
140 IFBA=.ANDPEEK(SO+939)=45ANDPEEK(56320
    )=125ANDPEEK(VO+1)=227THENGOSUB640
                                     :rem 252
150 IFPEEK(MF)THEN170                :rem 245
160 POKEMF,1:OP=OP-1:POKESO+30+2*OP,30:PO
    KESO+31+2*OP,31:GOSUB430         :rem 184
170 GETR$:IFR$<>""THENGOSUB390:GOTO170
                                     :rem 65
180 IFOP>0THEN60                     :rem 202
190 IFSC>HITHENHI=SC                 :rem 33
200 H1=INT(HI/65536):POKE820,H1      :rem 245
210 HI=HI-H1*65536:H1=INT(HI/256):POKE821
    ,H1                              :rem 253
220 H1=HI-H1*256:POKE822,H1          :rem 242
230 PRINT"{HOME}{DOWN}{YEL}":I$="{UP}↑◆↑◆
    ↑◆↑◆↑◆"                          :rem 146
240 FORI=29TO0STEP-1:GOSUB430        :rem 44
250 IFPEEK(MF+4)THEN250              :rem 84
260 POKEMF+4,5                       :rem 26
270 I$=I$+LEFT$(RIGHT$(I$,2),1)      :rem 150
280 PRINTSPC(I)I$;:NEXT              :rem 200
290 FORI=1TO21:PRINT:PRINTI$;:GOSUB430
                                     :rem 198
300 IFPEEK(MF+4)THEN300              :rem 76
310 POKEMF+4,10:NEXT                 :rem 187
320 PRINT"{HOME}{9 DOWN}{CYN}"SPC(8)"
    {3 SPACES}PLAY AGAIN?(Y OR N)
    {2 SPACES}"                      :rem 210
330 GETA$:IFA$=""THEN330             :rem 79
340 IFA$="N"THEN360                  :rem 34
350 RUN                              :rem 141
360 POKE56576,199:POKE53272,20:POKE648,4:
    POKEVO+21,0:END                  :rem 18
370 PRINT "DATA ERROR FOUND- CHECK FOR TY
    PO'S":GOTO360                    :rem 207
380 :{4 SPACES}PAUSE FUNCTION        :rem 185
390 IFASC(R$)<>133THENRETURN         :rem 233
400 GETR$:IFR$=""THEN400             :rem 109
410 RETURN                           :rem 117
420 :{4 SPACES}SOUNDS                :rem 172
430 POKES+15,20:POKES+17,4:POKES+19,9
                                     :rem 157
440 POKES+18,64:POKES+18,65:RETURN:rem 69
450 POKES+15,10:POKES+19,9           :rem 239
460 POKES+18,128:POKES+18,129:RETURN
                                     :rem 169
470 POKES+18,32:POKES+15,10          :rem 28
480 POKES+19,30                      :rem 66
490 POKES+18,33:RETURN               :rem 95
500 POKES+15,35:POKES+19,1:FORJ=1TO5:NEXT
                                     :rem 20
510 POKES+18,32:POKES+18,33:RETURN:rem 57
520 :{4 SPACES}SET DIFFICULTY LEVEL
                                     :rem 40
530 PRINT "{HOME}{4 DOWN}{6 RIGHT}SELECT
    {SPACE}DIFFICULTY LEVEL(1TO5)"
                                     :rem 243
540 GETR$:IFR$=""THEN540             :rem 119
550 IF ASC(R$)<49 THEN 540           :rem 56
560 IF ASC(R$)>53 THEN 540           :rem 54
570 DL=ASC(R$)-48                    :rem 160
580 HF=20-4*DL                       :rem 229
590 NL=13-DL                         :rem 150
600 POKEMF+1,NL                      :rem 122
610 SI=1+2*DL+INT(DL↑2/2)            :rem 160
620 PRINT "{UP}{37 SPACES}":RETURN:rem 20
630 :{5 SPACES}GET MORE BOMBS        :rem 89
640 BI=BI-2-INT(DL/2):IFBI<5THENBI=5
                                     :rem 151
650 BA=BI:HF=HF-1:IFHF<0THENHF=0     :rem 196
660 FORI=SO+919TOSO+959-BA*40STEP-40:POKE
    I,27:GOSUB500:NEXT               :rem 170
670 POKESO+1016,PEEK(SO+1016)-1      :rem 246
680 RETURN                           :rem 126
690 :{4 SPACES}BONUS                 :rem 96
700 BL=300:POKEVO+3,250              :rem 36
710 GOSUB470:K=10                    :rem 214
720 FORI=250TO50STEP-1:POKEVO+5,I:POKES+1
    5,K:K=K+1:NEXT                   :rem 200
730 IFOP=5THENSC=SC+SI:BO=BO+SI:GOTO870
                                     :rem 11
740 POKEVO+2,241:POKEVO+3,53         :rem 143
750 T=SO+30-2*OP                     :rem 133
760 I=241:II=0:POKEVO+16,PEEK(VO+16)AND25
    3                                :rem 217
770 GOSUB450:K=10                    :rem 218
780 IFI=257THENII=256:POKEVO+16,PEEK(VO+1
    6)OR2                            :rem 57
790 POKEVO+2,I-II:IFI>266+16*OPTHEN820
                                     :rem 23
800 K=K+8:IFK<40THENPOKES+15,K       :rem 59
810 I=I+8:GOTO780                    :rem 221
820 POKEVO+2,250:SL=SO+30+2*OP:OP=OP+1
                                     :rem 11
830 POKESL,28:POKESL+1,29            :rem 250
840 GOSUB450:FORK=10TO18STEP4:POKES+15,K:
    NEXTK                            :rem 195
850 POKEVO+2,0:POKEVO+3,0            :rem 242
860 POKESL,32:POKESL+1,32            :rem 242
870 SC=SC+SI:BO=BO+SI                :rem 47
```

```
880 SS$=STR$(SC):PRINT"{HOME}{4}"SPC(31-L
    EN(SS$))RIGHT$(SS$,LEN(SS$)-1):rem 99
890 FORI=1TO200:NEXT                  :rem 237
900 GOSUB470:K=211                    :rem 10
910 FORI=50TO250:POKEVO+5,I:POKES+15,K:K=
    K-1:NEXT                          :rem 49
920 POKES+15,0:POKEVO+16,0:RETURN     :rem 32
930 :{4 SPACES}TRACK SHOT             :rem 137
940 IFBA=.THENRETURN                  :rem 41
950 RW=32768+INT((PEEK(VO+1)-46)/8)*40
                                      :rem 73
960 POKEVO+3,PEEK(VO+1)+3:PX=173+DI*28
                                      :rem 216
970 GOSUB450:K=10:IFDITHEN1040        :rem 38
980 FORI=RW+18TORWSTEP-2:IFPEEK(I)=31THEN
    SL=I-1:I=RW-2                     :rem 213
990 IFPEEK(I)=30THENSL=I:I=RW-2       :rem 172
1000 POKEVO+2,PX:PX=PX-16:IFK<40THENK=K+4
     :POKES+15,K                      :rem 250
1010 NEXT                             :rem 1
1020 IFI=RW-2THEN1180                 :rem 217
1030 GOTO1100                         :rem 191
1040 IX=0:FORI=RW+21TORW+37STEP2:IFPEEK(I
     )=30THENSL=I:I=RW+39             :rem 124
1050 IFPEEK(I)=31THENSL=I-1:I=RW+39
                                      :rem 103
1060 POKEVO+2,PX-IX:PX=PX+16:IFPX=265THEN
     IX=256:POKEVO+16,2               :rem 230
1070 IFK<40THENK=K+4:POKES+15,K       :rem 103
1080 NEXT                             :rem 8
1090 IFI=RW+39THEN1180                :rem 24
1100 POKESL,28:POKESL+1,29:GOSUB450
                                      :rem 116
1110 TL=SL-65536:FORI=0TONL:IFL%(I)=TLTHE
     NL%(I)=0:I=NL+1                  :rem 151
1120 NEXT                             :rem 3
1130 FORK=10TO18STEP4:POKES+15,K:NEXT
                                      :rem 78
1140 SC=SC+SI:SS$=STR$(SC):PRINT"{HOME}
     {4}"SPC(31-LEN(SS$))RIGHT$(SS$,LEN(S
     S$)-1)                           :rem 243
1150 POKESL,32:POKESL+1,32            :rem 27
1160 BO=BO+SI                         :rem 238
1170 IFBO>BLTHENBO=BO-BL:GOSUB700     :rem 79
1180 POKEVO+2,0:POKEVO+3,0:POKEVO+16,0
                                      :rem 27
1190 POKE(SO+159+(20-BA)*40),32:BA=BA-1:I
     FBA=.THENPOKESO+1016,PEEK(SO+1016)+1
                                      :rem 124
1200 RETURN                           :rem 163
1210 :{4 SPACES}INITIALIZE SCREEN:rem 176
1220 A$=",,,,,,,,,,-./,,,,,,,,,,,,,,,-./
     ,,,,,,,,,,,,,-./,,"              :rem 85
1230 B$="{GRN}++++++++++++++++++++++++++
     ++++++++++"                      :rem 88
1240 FORI=STOS+23:POKEI,0:NEXT        :rem 148
1250 POKES+23,0:POKES+22,18           :rem 22
1260 POKES,32:POKES+1,2:POKES+24,31:POKES
     +3,14                            :rem 218
1270 POKES+5,40:POKES+6,0             :rem 181
1280 POKEVO+33,0:POKEVO+32,12         :rem 185
1290 PRINT"{2 CLR}{4} HIGH:00000"SPC(8)"S
     CORE:00000"                      :rem 253
1300 SS$=STR$(HI):PRINT"{HOME}{4}"SPC(12-
     LEN(SS$))RIGHT$(SS$,LEN(SS$)-1)
                                      :rem 129
1310 POKE214,22:PRINT:PRINT"{WHT}"LEFT$(A
     $,40)B$;                         :rem 40
1320 SYS49420:POKEVO+39,1:POKEVO+40,1
                                      :rem 196
1330 POKEVO+41,1:POKEVO+21,7:POKEMF+8,0
                                      :rem 66
1340 POKESO+999,43:POKESO+23527,5:rem 156
1350 FORI=SO+159TOSO+919STEP40:POKEI,27
                                      :rem 156
1360 POKEI+22528,2:NEXT               :rem 71
1370 POKESO+1016,16:POKEVO+1,100:POKEVO,1
     76:POKEVO+16,0:DI=0              :rem 81
1380 POKESO+1017,20:POKESO+1018,18
                                      :rem 180
1390 POKEVO+2,0:POKEVO+3,0            :rem 34
1400 POKEVO+5,250:POKEVO+4,216        :rem 238
1410 FORI=55326TO55335:POKEI,7:NEXT
                                      :rem 110
1420 RETURN                           :rem 167
1430 :{4 SPACES}LOAD DATA             :rem 60
1440 PRINT"{CLR}{DOWN}{7 SPACES}LOADING D
     ATA{3 SPACES}PLEASE WAIT"        :rem 69
1450 POKE56334,PEEK(56334)AND254      :rem 19
1460 POKE1,PEEK(1)AND251              :rem 105
1470 FORI=34816TO35327:POKEI,PEEK(I+18432
     ):NEXT                           :rem 41
1480 POKE1,PEEK(1)OR4                 :rem 213
1490 POKE56334,PEEK(56334)OR1         :rem 123
1500 FORI=SO+1024TOSO+1343:POKEI,0:NEXT:P
     OKESO+1280,255                   :rem 82
1510 READL:IFL=0THENGOTO1530          :rem 226
1520 FORI=0TO7:READA:POKEL+I,A:CK=CK+A:NE
     XT:GOTO1510                      :rem 30
1530 IFCK<>63389THEN370               :rem 54
1540 POKE251,111                      :rem 80
1550 RETURN                           :rem 171
1560 ;{4 SPACES}MOVE SCREEN TO TOP OF BAS
     IC                               :rem 139
1570 POKE648,128                      :rem 101
1580 POKE56576,PEEK(56576)AND252OR1
                                      :rem 247
1590 POKEVO+24,2                      :rem 146
1600 IFPEEK(251)<>111THENGOSUB1440
                                      :rem 233
1610 POKEVO+32,11:POKEVO+33,11        :rem 231
1620 POKE56,127:POKE52,127            :rem 191
1630 HI=PEEK(820)*65536+PEEK(821)*256+PEE
     K(822)                           :rem 27
1640 GOSUB 1220:GOSUB530              :rem 98
1650 RETURN                           :rem 172
1660 :{3 SPACES}CHARACTER DATA        :rem 174
1670 DATA35032,0,0,0,125,255,125,0,0
                                       :rem 1
1680 DATA35040,16,70,185,134,93,82,195,16
                                      :rem 37
1690 DATA35048,8,82,131,212,43,117,66,4
                                      :rem 186
1700 DATA35056,0,63,96,255,204,127,0,0
                                      :rem 121
1710 DATA35064,0,252,6,255,51,254,0,0
                                      :rem 65
1720 DATA35160,255,255,255,255,255,255,25
     5,255                            :rem 35
1730 DATA35168,0,0,0,0,0,0,0,0        :rem 204
1740 DATA35176,255,63,15,15,15,15,15,15
                                      :rem 181
1750 DATA35184,255,255,255,195,0,0,0,0
                                      :rem 127
1760 DATA35192,255,252,240,240,240,240,24
     0,240                             :rem 5
1770 :{3 SPACES}SPRITE DATA           :rem 250
1780 DATA33792,7,255,254,30,0,7,127,254
                                      :rem 191
1790 DATA33800,63,0,0,63,127,254,63,0
                                      :rem 73
1800 DATA33808,240,63,0,63,254,0,0,0
                                      :rem 12
```

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1810 DATA33856,7,255,254,30,0,7,127,254
                                        :rem 186
1820 DATA33864,1,0,0,1,127,254,1,0
                                        :rem 165
1830 DATA33872,240,1,0,63,254,0,0,0
                                        :rem 216
1840 DATA33920,127,255,224,224,0,120,128,
     127                                :rem 166
1850 DATA33928,254,252,0,0,252,127,254,25
     2                                  :rem 76
1860 DATA33936,15,0,127,252,0,0,0,0
                                        :rem 218
1870 DATA33984,127,255,224,224,0,120,128,
     127                                :rem 179
1880 DATA33992,254,128,0,0,128,127,254,12
     8                                  :rem 86
1890 DATA34000,15,0,127,252,0,0,0,0
                                        :rem 204
1900 :{3 SPACES}ML ROUTINES             :rem 22
1910 DATA49152,166,47,134,95,166,48,134,9
     6                                  :rem 104
1920 DATA49160,160,0,177,95,201,204,240,1
     6                                  :rem 68
1930 DATA49168,160,2,177,95,24,101,95,133
                                        :rem 38
1940 DATA49176,95,144,0,230,96,76,8,192
                                        :rem 207
1950 DATA49184,96,165,143,162,3,10,202,20
     8                                  :rem 81
1960 DATA49192,252,24,101,143,10,24,101,1
     43                                 :rem 109
1970 DATA49200,24,105,59,133,143,74,74,56
                                        :rem 36
1980 DATA49208,229,11,176,252,101,11,133,
     11                                 :rem 118
1990 DATA49216,96,24,32,148,177,160,0,177
                                        :rem 47
2000 DATA49224,88,208,63,162,40,134,93,16
     2                                  :rem 78
2010 DATA49232,128,134,94,162,34,134,11,3
     2                                  :rem 64
2020 DATA49240,33,192,165,11,201,18,48,7
                                        :rem 224
2030 DATA49248,201,21,16,3,24,105,17,101
                                        :rem 208
2040 DATA49256,93,133,93,144,2,230,94,160
                                        :rem 29
2050 DATA49264,0,177,93,201,32,208,93,200
                                        :rem 21
2060 DATA49272,177,93,201,32,208,86,165,9
     3                                  :rem 93
2070 DATA49280,145,88,165,94,136,145,88,7
     6                                  :rem 110
2080 DATA49288,189,192,177,88,133,94,200,
     177                                :rem 213
2090 DATA49296,88,133,93,160,40,177,93,20
     1                                  :rem 95
2100 DATA49304,32,208,58,200,177,93,201,3
     2                                  :rem 66
2110 DATA49312,208,51,169,32,160,0,145,93
                                        :rem 19
2120 DATA49320,200,145,93,165,93,24,105,4
     0                                  :rem 65
2130 DATA49328,133,93,145,88,136,144,6,23
     0                                  :rem 85
2140 DATA49336,94,165,94,145,88,169,30,14
     5                                  :rem 103
2150 DATA49344,93,200,169,31,145,93,165,9
     4                                  :rem 91
2160 DATA49352,24,105,88,133,94,169,7,145
                                        :rem 43
2170 DATA49360,93,136,145,93,96,48,253,16
     9                                  :rem 107
2180 DATA49368,32,160,0,145,93,200,145,93
                                        :rem 29
2190 DATA49376,136,152,145,88,200,145,88,
     141                                :rem 193
2200 DATA49384,122,193,76,212,192,32,0,19
     2                                  :rem 75
2210 DATA49392,160,1,177,95,201,128,240,6
                                        :rem 25
2220 DATA49400,32,8,192,76,240,192,173,12
     3                                  :rem 74
2230 DATA49408,193,133,11,32,33,192,230,1
     1                                  :rem 62
2240 DATA49416,32,65,192,96,120,162,25,14
     2                                  :rem 79
2250 DATA49424,20,3,162,193,142,21,3,88
                                        :rem 178
2260 DATA49432,96,72,138,72,162,3,189,124
                                        :rem 44
2270 DATA49440,193,240,3,222,124,193,202,
     16                                 :rem 117
2280 DATA49448,245,173,0,220,74,176,11,17
     4                                  :rem 84
2290 DATA49456,1,208,224,59,144,4,202,142
                                        :rem 28
2300 DATA49464,1,208,74,176,11,174,1,208
                                        :rem 231
2310 DATA49472,224,227,176,4,232,142,1,20
     8                                  :rem 72
2320 DATA49480,74,176,3,238,128,193,74,17
     6                                  :rem 100
2330 DATA49488,3,238,129,193,74,176,3,238
                                        :rem 53
2340 DATA49496,130,193,173,127,193,208,21
     ,169                               :rem 243
2350 DATA49504,12,141,127,193,169,63,77,2
     44                                 :rem 139
2360 DATA49512,136,141,244,136,169,252,77
     ,252                               :rem 238
2370 DATA49520,136,141,252,136,104,170,10
     4,76                               :rem 220
2380 DATA49528,49,234,0,0,0,0,0,0:rem 121
2390 DATA0                              :rem 24
```

The Beginner's Corner

See article on page 83.

Program 1: Quilt Squares For VIC

```
1 REM QUILT SQUARES VIC                 :rem 170
2 GOTO15                                :rem 209
3 POKE198,0:POKEV,231:FORD=1TO50:NEXT:POK
  EV,0:RETURN                           :rem 106
4 POKEA,32:POKEA+1,32:POKEA+22,32:POKEA+2
  3,32:P=1:RETURN                       :rem 115
5 POKEA,160:POKEA+1,160:POKEA+22,160:POKE
  A+23,160:RETURN                       :rem 68
6 POKEA,32:POKEA+1,233:POKEA+22,233:POKEA
  +23,160:RETURN                        :rem 21
7 POKEA,160:POKEA+1,105:POKEA+22,105:POKE
  A+23,32:RETURN                        :rem 18
8 POKEA,223:POKEA+1,32:POKEA+22,160:POKEA
  +23,223:RETURN                        :rem 21
```

```
9 POKEA,95:POKEA+1,160:POKEA+22,32:POKEA+
  23,95:RETURN                          :rem 196
10 A1=PEEK(A):A2=PEEK(A+1):A3=PEEK(A+22):
   A4=PEEK(A+23):RETURN                 :rem 66
11 POKEA,A1:POKEA+1,A2:POKEA+22,A3:POKEA+
   23,A4:RETURN                         :rem 227
12 POKEA,79:POKEA+1,80:POKEA+22,76:POKEA+
   23,122:RETURN                        :rem 240
13 POKEA+M,P:POKEA+1+M,P:POKEA+22+M,P:POK
   EA+23+M,P:RETURN                     :rem 55
14 FORI=8054TO8118:POKEI,32:NEXTI:RETURN
                                        :rem 55
15 PRINT"{CLR}{DOWN}{4 RIGHT}QUILT SQUARE
   S"                                   :rem 2
16 DIMS(16),Q(16),R(16),QQ(3)           :rem 9
17 PRINT"{DOWN}USE F1 TO MOVE TO THE QUIL
   T SQUARE DESIRED, THEN PRESS <RETURN>.
   "                                    :rem 220
18 PRINT"{DOWN}FILL IN THE SAMPLE
   {4 SPACES}SQUARES."                  :rem 254
19 FORI=1TO16:READS(I),Q(I),R(I):NEXT
                                        :rem 253
20 DATA7864,7703,79,7866,7705,160,7868,77
   07,233,7870,7751,105                 :rem 73
21 DATA7908,7709,223,7910,7753,95,7912,77
   11,160,7914,7713,233                 :rem 53
22 DATA7952,7757,105,7954,7715,223,7956,7
   759,95,7958,7717,160                 :rem 92
23 DATA7996,7719,233,7998,7763,105,8000,7
   721,223,8002,7765,95                 :rem 65
24 QQ(1)=6:QQ(2)=11:QQ(3)=16:POKE36878,15
   :V=36876:M=30720                     :rem 165
25 A$="OPOPOPOP":B$="L@L@L@L@"          :rem 2
26 PRINT"{DOWN}ONE COLOR IS WHITE.
   {3 SPACES}HOW MANY OTHER COLORS, 1, 2,
    OR 3?":GOSUB3                       :rem 84
27 GETE$:IFE$=""THEN27                  :rem 253
28 IFE$<"1"ORE$>"3"THEN27               :rem 106
29 N=VAL(E$)                            :rem 147
30 FORI=1TON                            :rem 242
31 PRINT"{2 DOWN}CHOOSE COLOR";I        :rem 27
32 PRINT" {RVS}{BLK} {OFF}{2 SPACES}{RVS}
   {RED} {OFF}{2 SPACES}{RVS}{CYN} {OFF}
   {2 SPACES}{RVS}{PUR} {OFF}{2 SPACES}
   {RVS}{GRN} {OFF}{2 SPACES}{RVS}{BLU}
   {OFF}{2 SPACES}{RVS}{YEL} {OFF}{BLU}"
                                        :rem 147
33 PRINT" 1{2 SPACES}2{2 SPACES}3
   {2 SPACES}4{2 SPACES}5{2 SPACES}6
   {2 SPACES}7":GOSUB3                  :rem 144
34 GETE$:IFE$=""THEN34                  :rem 249
35 IFE$<"1"ORE$>"7"THEN34               :rem 106
36 C(I)=VAL(E$):PRINTTAB(3*C(I)-2)"↑"
                                        :rem 74
37 IFC(I)=1THENC(I)=0                   :rem 189
38 NEXTI                                :rem 243
39 PRINT"{CLR}{7 DOWN}"                 :rem 71
40 FORI=1TO4:PRINTTAB(8)A$:PRINTTAB(8)B$:
   NEXTI                                :rem 180
41 POKE7703,79:POKE7704,101:POKE7725,99:P
   OKE7703+M,0:POKE7704+M,0:POKE7725+M,0
                                        :rem 5
42 FORI=2TOQQ(N):POKEQ(I),R(I):NEXTI
                                        :rem 23
43 FORI=2TO6:POKEQ(I)+M,C(1):NEXTI:rem 94
44 FORI=7TO11:POKEQ(I)+M,C(2):NEXTI
                                        :rem 145
45 FORI=12TO16:POKEQ(I)+M,C(3):NEXTI
                                        :rem 196
46 FORT=1TO16:GOSUB3:POKES(T),63    :rem 0
47 FORI=1TOQQ(N):GOSUB3:P=PEEK(Q(I)+M):IF
   I=1THENP=1                           :rem 231
48 POKEQ(I),32:POKEQ(I),R(I)            :rem 131
49 GETE$:IFE$=""THEN48                  :rem 4
50 IFASC(E$)=13THEN53                   :rem 189
51 IFE$<>"{F1}"THEN48                   :rem 60
52 NEXTI:GOTO47                         :rem 205
53 A=S(T):ONI GOSUB4,5,6,7,8,9,5,6,7,8,9,
   5,6,7,8,9                            :rem 127
54 GOSUB13:NEXTT                        :rem 26
55 PRINT"{2 DOWN}PRESS F1--CHANGE":PRINTT
   AB(6)"F7--PRINT QUILT":GOSUB3        :rem 170
56 GETE$:IFE$="{F7}"THEN74              :rem 137
57 IFE$<>"{F1}"THEN56                   :rem 65
58 GOSUB14                              :rem 82
59 PRINT"{2 UP}PRESS F7--NO CHANGE":PRINT
   TAB(6)"F1--CHANGE":GOSUB3            :rem 213
60 FORT=1TO16:A=S(T):GOSUB10:GOSUB3:P=PEE
   K(A+M):IFP=1THENP=0:GOSUB13          :rem 88
61 GOSUB12:GOSUB11                      :rem 102
62 GETE$:IFE$="{F7}"THENGOSUB11:GOTO73
                                        :rem 218
63 IFE$<>"{F1}"THEN61                   :rem 58
64 GOSUB12                              :rem 77
65 FORI=1TOQQ(N):GOSUB3:P=PEEK(Q(I)+M)
                                        :rem 122
66 POKEQ(I),32:POKEQ(I),R(I)            :rem 131
67 GETE$:IFE$=""THEN66                  :rem 4
68 IFASC(E$)=13THEN71                   :rem 198
69 IFE$<>"{F1}"THEN66                   :rem 69
70 NEXTI:GOTO65                         :rem 205
71 A=S(T):ONI GOSUB4,5,6,7,8,9,5,6,7,8,9,
   5,6,7,8,9                            :rem 127
72 GOSUB13                              :rem 77
73 NEXTT:GOSUB14:PRINT"{5 UP}":GOTO55
                                        :rem 217
74 FORT=1TO16:A=S(T):P=PEEK(A+M):GOSUB10
                                        :rem 223
75 A=S(T)-184:GOSUB11:GOSUB13:A=S(T)-176:
   GOSUB11:GOSUB13                      :rem 155
76 A=S(T)-8:GOSUB11:GOSUB13             :rem 130
77 NEXTT                                :rem 1
78 FORT=1TO12:A=S(T):P=PEEK(A+M):GOSUB10
                                        :rem 223
79 A=S(T)+168:GOSUB11:GOSUB13:A=S(T)+176:
   GOSUB11:GOSUB13                      :rem 157
80 NEXTT                                :rem 251
81 FORT=1TO16:A=S(T):P=PEEK(A+M):GOSUB10
                                        :rem 221
82 IFT/4=INT(T/4)THEN86                 :rem 125
83 A=S(T)-168:GOSUB11:GOSUB13:A=S(T)+8:GO
   SUB11:GOSUB13                        :rem 52
84 A=S(T)+184:IFT>12THEN86              :rem 5
85 GOSUB11:GOSUB13                      :rem 109
86 NEXTT                                :rem 1
87 PRINT"{HOME}{19 DOWN}"               :rem 150
88 END                                  :rem 71
```

Program 2: Quilt Squares For 64

Note: Before typing in or loading the program, enter the following line to clear memory for custom characters.

```
POKE 8192,0: POKE 44,32: NEW
```

```
10 REM QUILT SQUARES                    :rem 248
20 GOTO 310                             :rem 47
30 POKE A,103:POKE A+1,103:POKE A+40,103:
   POKE A+41,103:CC=C(1):RETURN         :rem 40
40 POKE A,103:POKE A+1,100:POKE A+40,100:
   POKE A+41,96:CC=C(1):RETURN          :rem 254
```

```
50 POKE A,102:POKE A+1,103:POKE A+40,96:P
   OKE A+41,102:CC=C(1):RETURN      :rem 3
60 POKE A,101:POKE A+1,96:POKE A+40,103:P
   OKE A+41,101:CC=C(1):RETURN      :rem 2
70 POKE A,96:POKE A+1,99:POKE A+40,99:POK
   E A+41,103:CC=C(1):RETURN        :rem 195
80 POKE A,96:POKE A+1,96:POKE A+40,96:POK
   E A+41,96:CC=C(1):RETURN         :rem 153
90 POKE A,160:POKE A+1,160:POKE A+40,160:
   POKE A+41,160:CC=C(1):RETURN     :rem 58
100 POKE A,160:POKE A+1,163:POKE A+40,163
    :POKE A+41,103:CC=C(1):RETURN:rem 101
110 POKE A,160:POKE A+1,163:POKE A+40,163
    :POKE A+41,103:CC=C(2):RETURN:rem 103
120 POKE A,165:POKE A+1,160:POKE A+40,167
    :POKE A+41,165:CC=C(1):RETURN:rem 117
130 POKE A,167:POKE A+1,164:POKE A+40,164
    :POKE A+41,160:CC=C(2):RETURN:rem 117
140 POKE A,167:POKE A+1,164:POKE A+40,164
    :POKE A+41,160:CC=C(1):RETURN:rem 117
150 POKE A,166:POKE A+1,167:POKE A+40,160
    :POKE A+41,166:CC=C(1):RETURN:rem 122
160 POKE A,166:POKE A+1,167:POKE A+40,160
    :POKE A+41,166:CC=C(2):RETURN:rem 124
170 POKE A,165:POKE A+1,160:POKE A+40,167
    :POKE A+41,165:CC=C(2):RETURN:rem 123
180 POKE A,224:POKE A+1,224:POKE A+40,224
    :POKE A+41,224:CC=C(1):RETURN:rem 110
190 POKE A,224:POKE A+1,227:POKE A+40,227
    :POKE A+41,231:CC=C(1):RETURN:rem 115
200 POKE A,224:POKE A+1,227:POKE A+40,227
    :POKE A+41,231:CC=C(2):RETURN:rem 108
210 POKE A,224:POKE A+1,227:POKE A+40,227
    :POKE A+41,231:CC=C(3):RETURN:rem 110
220 POKE A,229:POKE A+1,224:POKE A+40,231
    :POKE A+41,229:CC=C(1):RETURN:rem 113
230 POKE A,229:POKE A+1,224:POKE A+40,231
    :POKE A+41,229:CC=C(2):RETURN:rem 115
240 POKE A,229:POKE A+1,224:POKE A+40,231
    :POKE A+41,229:CC=C(3):RETURN:rem 117
250 POKE A,231:POKE A+1,228:POKE A+40,228
    :POKE A+41,224:CC=C(3):RETURN:rem 116
260 POKE A,231:POKE A+1,228:POKE A+40,228
    :POKE A+41,224:CC=C(2):RETURN:rem 116
270 POKE A,231:POKE A+1,228:POKE A+40,228
    :POKE A+41,224:CC=C(1):RETURN:rem 116
280 POKE A,230:POKE A+1,231:POKE A+40,224
    :POKE A+41,230:CC=C(1):RETURN:rem 103
290 POKE A,230:POKE A+1,231:POKE A+40,224
    :POKE A+41,230:CC=C(2):RETURN:rem 105
300 POKE A,230:POKE A+1,231:POKE A+40,224
    :POKE A+41,230:CC=C(3):RETURN :rem 98
310 PRINT "{CLR}":PRINT "TRANSFERRING CHA
    RACTER SET"                      :rem 17
320 PRINT "PLEASE WAIT..."           :rem 223
330 REM TRANSFER CHARACTER SET TO RAM
                                     :rem 219
340 POKE 56334,0:POKE 1,51           :rem 83
350 FOR C=2048 TO 6143               :rem 62
360 POKE C,PEEK(C+51200)             :rem 19
370 NEXT C                           :rem 28
380 POKE 1,55:POKE 56334,129:POKE 53272,1
    9                                :rem 201
390 REM                              :rem 128
400 POKE 53281,15                    :rem 88
410 PRINT "{CLR}{4}":PRINT TAB(13)"QUIL
    T SQUARES"                       :rem 218
420 DIM S(16),Q(28),R(28)            :rem 236
430 PRINT "{DOWN}USE F1 TO MOVE TO THE QU
    ILT SQUARE"                      :rem 155
440 PRINT "DESIRED, THEN PRESS <RETURN>."
                                     :rem 217
450 PRINT "{DOWN}FILL IN THE SAMPLE SQUAR
    ES."                             :rem 46
460 REM REDEFINE CHARACTERS          :rem 160
470 FOR C=2048+8*35 TO 2048+8*42-1
                                     :rem 135
480 READ G:POKE C,G                  :rem 30
490 NEXT C                           :rem 31
500 FOR C=2048+27*8 TO 2048+30*8-1:READ G
    :POKE C,G:NEXT C                 :rem 247
510 DATA 0,1,3,7,15,31,63,127        :rem 124
520 DATA 255,254,252,248,240,224,192,128
                                     :rem 184
530 DATA 128,192,224,240,248,252,254,255
                                     :rem 185
540 DATA 127,63,31,15,7,3,1,0        :rem 127
550 DATA 255,255,255,255,255,255,255,255
                                     :rem 200
560 DATA 255,128,128,128,128,128,128,128
                                     :rem 194
570 DATA 255,1,1,1,1,1,1,1           :rem 221
580 DATA 128,128,128,128,128,128,128,255
                                     :rem 196
590 DATA 255,129,129,129,129,129,129,255
                                     :rem 204
600 DATA 1,1,1,1,1,1,1,255           :rem 215
610 REM SOUND                         :rem 4
620 FOR C=54272 TO 54296:POKE C,0:NEXT
                                     :rem 49
630 POKE 54296,15:POKE 54277,190:POKE 542
    78,248                           :rem 217
640 HF=54273:LF=54272:W=54276         :rem 77
650 A$="()()()()"                    :rem 197
660 B$="[][][][]"                     :rem 99
670 FOR I=1 TO 16:READ S(I):NEXT I:rem 74
680 DATA 1352,1354,1356,1358,1432,1434,14
    36,1438                          :rem 88
690 DATA 1512,1514,1516,1518,1592,1594,15
    96,1598                          :rem 109
700 FOR I=1 TO 28:READ Q(I),R(I):NEXT I
                                     :rem 93
710 DATA 1142,103,1262,100,1382,102,1379,
    101,1259,99,1139,96              :rem 149
720 DATA 1136,160,1256,163,1376,163,1496,
    165,1499,164,1502,164             :rem 17
730 DATA 1622,166,1619,166,1616,165
                                     :rem 208
740 DATA 1133,224,1253,227,1373,227,1493,
    227,1613,229,1733,229,1853,229
                                     :rem 205
750 DATA 1856,228,1859,228,1862,228,1742,
    230,1739,230,1736,230            :rem 28
760 QQ(2)=6:QQ(3)=15:QQ(4)=28        :rem 64
770 PRINT "{2 DOWN}CHOOSE NUMBER OF COLOR
    S:{2 SPACES}2, 3, OR 4"          :rem 78
780 GOSUB 2020                       :rem 227
790 GET E$:IF E$<"2" OR E$>"4" THEN 790
                                     :rem 92
800 N=VAL(E$)                        :rem 192
810 FOR I=1 TO N                      :rem 40
820 PRINT "{3 DOWN}CHOOSE COLOR ";I
                                     :rem 98
830 PRINT "{DOWN}{RVS}{BLK} {OFF}
    {2 SPACES}{RVS}{WHT} {OFF}{2 SPACES}
    {RVS}{RED} {OFF}{2 SPACES}{RVS}{CYN}
    {SPACE}{OFF}{2 SPACES}{RVS}{PUR}
    {OFF}{2 SPACES}{RVS}{GRN} {OFF}
    {2 SPACES}{RVS}{BLU} {OFF}{2 SPACES}
    {RVS}{YEL} {OFF}{2 SPACES}{RVS}{13}
    {SPACE}{4}"                      :rem 142
840 PRINT "0{2 SPACES}1{2 SPACES}2
    {2 SPACES}3{2 SPACES}4{2 SPACES}5
```

```
    {2 SPACES}6{2 SPACES}7{2 SPACES}8"
                                        :rem 65
850 GOSUB 2020                         :rem 225
860 GET E$:IF E$<"0" OR E$>"8" THEN 860
                                        :rem 90
870 C(I)=VAL(E$)                        :rem 86
880 PRINT TAB(3*C(I))"↑"                :rem 49
890 NEXT I                              :rem 41
900 PRINT "{CLR}"                      :rem 253
910 POKE 53282,C(2):POKE 53283,C(3):POKE
    {SPACE}53284,C(4)                  :rem 131
920 POKE 53265,PEEK(53265) OR 64       :rem 129
930 REM PRINT POSSIBLE SQUARES         :rem 146
940 REM TWO COLORS                      :rem 77
950 CC=C(1)                             :rem 38
960 POKE 1139,96:POKE 1139+LF,CC       :rem 221
970 POKE 1142,103:POKE 1142+LF,CC      :rem 247
980 POKE 1259,99:POKE 1259+LF,CC       :rem 232
990 POKE 1262,100:POKE 1262+LF,CC      :rem 252
1000 POKE 1379,101:POKE 1379+LF,CC:rem 46
1010 POKE 1382,102:POKE 1382+LF,CC:rem 36
1020 IF N=2 THEN 1260                   :rem 7
1030 POKE 1136,160:POKE 1136+LF,CC:rem 36
1040 POKE 1256,163:POKE 1256+LF,CC:rem 46
1050 POKE 1376,163:POKE 1376+LF,C(2)
                                       :rem 117
1060 POKE 1496,165:POKE 1496+LF,CC:rem 62
1070 POKE 1499,164:POKE 1499+LF,C(2)
                                       :rem 132
1080 POKE 1502,164:POKE 1502+LF,CC:rem 39
1090 POKE 1616,165:POKE 1616+LF,C(2)
                                       :rem 117
1100 POKE 1619,166:POKE 1619+LF,C(2)
                                       :rem 116
1110 POKE 1622,166:POKE 1622+LF,CC:rem 41
1120 IF N=3 THEN 1260                   :rem 9
1130 POKE 1133,224:POKE 1133+LF,CC:rem 32
1140 POKE 1253,227:POKE 1253+LF,CC:rem 42
1150 POKE 1373,227:POKE 1373+LF,C(2)
                                       :rem 113
1160 POKE 1493,227:POKE 1493+LF,C(3)
                                       :rem 121
1170 POKE 1613,229:POKE 1613+LF,CC:rem 47
1180 POKE 1733,229:POKE 1733+LF,C(2)
                                       :rem 118
1190 POKE 1853,229:POKE 1853+LF,C(3)
                                       :rem 126
1200 POKE 1736,230:POKE 1736+LF,C(3)
                                       :rem 110
1210 POKE 1739,230:POKE 1739+LF,C(2)
                                       :rem 116
1220 POKE 1742,230:POKE 1742+LF,C(1)
                                       :rem 104
1230 POKE 1856,228:POKE 1856+LF,C(3)
                                       :rem 126
1240 POKE 1859,228:POKE 1859+LF,C(2)
                                       :rem 132
1250 POKE 1862,228:POKE 1862+LF,CC:rem 57
1260 PRINT "{6 DOWN}"                   :rem 0
1270 FOR I=1 TO 4                      :rem 63
1280 PRINT TAB(8)A$:PRINT TAB(8)B$
                                       :rem 170
1290 NEXT I                             :rem 84
1300 FOR T=1 TO 16                     :rem 119
1310 GOSUB 2020                         :rem 9
1320 POKE S(T),63                      :rem 130
1330 FOR I=1 TO QQ(N)                  :rem 73
1340 GOSUB 2020                        :rem 12
1350 PP=0                              :rem 214
1360 P=PEEK(Q(I)+LF):IF P=0 THEN PP=1
                                       :rem 56
1370 POKE Q(I),28:POKE Q(I)+LF,PP:POKE Q(
     I),R(I):POKE Q(I)+LF,P            :rem 81
1380 GET E$:IF E$="" THEN 1370         :rem 194
1390 IF ASC(E$)=13 THEN 1430           :rem 133
1400 IF E$<>"{F1}" THEN 1370           :rem 250
1410 NEXT I                            :rem 78
1420 GOTO 1330                         :rem 199
1430 A=S(T)                            :rem 62
1440 IF I>14 THEN 1470                 :rem 63
1450 ON I GOSUB 30,40,50,60,70,80,90,100,
     110,120,130,140,150,160           :rem 66
1460 GOTO 1480                         :rem 209
1470 ON I-14 GOSUB 170,180,190,200,210,22
     0,230,240,250,260,270,280,290,300
                                       :rem 63
1480 GOSUB 2040                        :rem 19
1490 NEXT T                            :rem 97
1500 PRINT "{HOME}{17 DOWN}"           :rem 203
1510 PRINT "PRESS F1 TO CHANGE"        :rem 229
1520 PRINT "{6 SPACES}F7 TO PRINT QUILT"
                                       :rem 213
1530 GOSUB 2020                        :rem 13
1540 GET E$:IF E$="{F7}" THEN 1880:rem 78
1550 IF E$<>"{F1}" THEN 1540           :rem 255
1560 FOR I=1744 TO 1766:POKE I,32:POKE I+
     40,32:NEXT I                      :rem 87
1570 PRINT "{2 UP}PRESS RETURN--NO CHANGE
     "                                 :rem 202
1580 PRINT TAB(6)"F1 TO CHANGE, THEN"
                                       :rem 24
1590 PRINT TAB(9)"PROCEED AS BEFORE"
                                       :rem 74
1600 FOR T=1 TO 16                     :rem 122
1610 PS=0:A=S(T):GOSUB 2020             :rem 6
1620 PT=PEEK(A+LF):IF PT=0 THEN PS=1
                                       :rem 56
1630 GOSUB 2050                        :rem 17
1640 POKE A,40:POKE A+1,41:POKE A+40,27:P
     OKE A+41,29                        :rem 1
1650 GOSUB 2060                        :rem 20
1660 GET E$:IF E$="" THEN 1640         :rem 195
1670 IF ASC(E$)=13 THEN 1850           :rem 140
1680 IF E$<>"{F1}" THEN 1640            :rem 4
1690 POKE A,40:POKE A+1,41:POKE A+40,27:P
     OKE A+41,29                        :rem 6
1700 FOR I=1 TO QQ(N)                  :rem 74
1710 GOSUB 2020                        :rem 13
1720 PP=0                              :rem 215
1730 P=PEEK(Q(I)+LF):IF P=0 THEN PP=1
                                       :rem 57
1740 POKE Q(I),28:POKE Q(I)+LF,PP:POKE Q(
     I),R(I):POKE Q(I)+LF,P            :rem 82
1750 GET E$:IF E$="" THEN 1740         :rem 196
1760 IF ASC(E$)=13 THEN 1800           :rem 135
1770 IF E$<>"{F1}" THEN 1740            :rem 5
1780 NEXT I                            :rem 88
1790 GOTO 1700                         :rem 210
1800 IF I>14 THEN 1830                 :rem 63
1810 ON I GOSUB 30,40,50,60,70,80,90,100,
     110,120,130,140,150,160           :rem 66
1820 GOTO 1840                         :rem 209
1830 ON I-14 GOSUB 170,180,190,200,210,22
     0,230,240,250,260,270,280,290,300
                                       :rem 63
1840 GOSUB 2040                        :rem 19
1850 NEXT T                            :rem 97
1860 FOR I=1744 TO 1769:POKE I,32:POKE I+
     40,32:POKE I+80,32:NEXT I         :rem 51
1870 GOTO 1500                         :rem 207
1880 FOR T=1 TO 16                     :rem 132
1890 A=S(T)                            :rem 72
```

```
1900 GOSUB 2050                          :rem 17
1910 CC=PEEK(A+LF)                       :rem 2
1920 FOR B=S(T)-320 TO S(T)+320 STEP 320
                                         :rem 24
1930 FOR A=B-8 TO B+24 STEP 8            :rem 195
1940 GOSUB 2060:GOSUB 2040               :rem 150
1950 NEXT A,B                            :rem 189
1960 NEXT T                              :rem 99
1970 PRINT "{4 DOWN}PRESS F7 TO END PROGR
     AM.";                               :rem 235
1980 GOSUB 2020                          :rem 22
1990 GET E$:IF E$="{F7}" THEN 2070:rem 79
2000 GOTO 1990                           :rem 206
2010 STOP                                :rem 9
2020 POKE 198,0:POKE HF,84:POKE LF,125
                                         :rem 63
2030 POKE W,17:FOR D=1 TO 60:NEXT D:POKE
     {SPACE}W,0:RETURN                   :rem 174
2040 L=A+LF:POKE L,CC:POKE L+1,CC:POKE L+
     40,CC:POKE L+41,CC:RETURN           :rem 126
2050 A1=PEEK(A):A2=PEEK(A+1):A3=PEEK(A+40
     ):A4=PEEK(A+41):RETURN              :rem 168
2060 POKE A,A1:POKE A+1,A2:POKE A+40,A3:P
     OKE A+41,A4:RETURN                  :rem 73
2070 PRINT"{CLR}"                        :rem 45
2080 PRINT "PRESS RUN/STOP - RESTORE"
                                         :rem 227
2090 PRINT "BEFORE RUNNING PROGRAM AGAIN.
     {2 DOWN}"                           :rem 56
2100 END                                 :rem 154
```

Robot Math

See article on page 90.

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1: Robot Math—VIC Version

```
1 Q=108:READP1$,P2,P3$,P4:GOTO62   :rem 95
2 POKEB,0:POKEB+1,0:POKEB+2,0:POKEB+4,0:R
  ETURN                            :rem 70
3 POKEB+4,15:POKEB+1,180:FORM=1TOC:NEXT:G
  OTO2                             :rem 65
4 F=INT(RND(1)*9):RETURN           :rem 214
5 POKED,3:POKED+1,3:POKEB+4,15:FORL=99TO2
  55:POKEB+2,L:POKEB,L:NEXT:GOSUB2:GOTO92
                                   :rem 76
6 POKEB+4,15:POKEB+2,160:FORM=1TO400:NEXT
  :GOTO2                           :rem 148
7 PRINTM$;" {RVS}{GRN}PRESS RTN TO CHANGE
  ":RETURN                         :rem 200
8 PRINTM$;"{5 SPACES}{RVS}{RED}ENTER DIGI
  T{OFF}{4 SPACES}":RETURN         :rem 126
9 IFF>5THENL=126:IFF>9THENL=Q:M=1:IFF>30T
  HENL=90:M=0:IFF>50THENL=Q:M=1:IFF>99THE
  NF=0                             :rem 108
10 POKEE,L:POKEE+1,L:POKED+21,M:POKED+24,
   M:GOTO36                        :rem 22
11 PRINT"{HOME}":PRINTTAB(L);M$;O$;:GOSUB
   3:PRINTN$:RETURN                :rem 86
12 M$=" N{2 T}M {DOWN}{6 LEFT} MZZN
   {DOWN}{6 LEFT} {F}L@{D} {DOWN}{6 LEFT}
    £{Q}{W}{*} {DOWN}{6 LEFT}{2 SPACES}O
   P{2 SPACES}{DOWN}{6 LEFT} {RVS}£
   {2 SPACES}{*}{OFF} "            :rem 222
13 N$="{6 LEFT} WWWW ":O$="{DOWN}{6 LEFT}
    ZZZZ ":B=36874:READP1$,P2,P3$,P4:POKE
   B+5,30:POKE649,1                :rem 170
14 PRINT"{CLR}{9 DOWN}{RVS}{GRN} M=MENU--
   ---DEL=ERASE {HOME}":L8=48:POKE143,PEE
   K(162):GOTO92                   :rem 72
15 POKE651,255:PRINT"{HOME}":R=38649:S=79
   29:Y=P2:D=38446:E=7726:IFP1$="-"ORP2=1
   ORP2>3THENY=2                   :rem 115
16 FORI=P2TO1STEP-1:A(I)=0:S(I)=0:FORK=1T
   OY:GOSUB3:GOSUB4                :rem 139
17 A(I)=A(I)+F:S(I)=S(I)-F         :rem 144
18 M=(K*22)+I:POKER+M,4:POKES+M,F+48:IFK=
   1THENL1=F                       :rem 18
19 NEXT:IFP1$="-"THENGOSUB57:GOTO21
                                   :rem 182
20 L=A(I):N=9:GOTO22               :rem 155
21 S(I)=S(I)+2*L1:L=S(I):N=0       :rem 35
22 GOSUB49:A(I)=L                  :rem 239
23 NEXTI                           :rem 237
24 FORK=1TOY:FORI=1TOP2            :rem 255
25 M=K*22+I:IFPEEK(S+M)>48THEN28   :rem 139
26 IFI=P2THENV=1                   :rem 242
27 POKES+M,32:NEXT                 :rem 109
28 NEXTK:IFV=1THENV=0:GOTO15       :rem 76
29 A=0:U=-1:FORI=P2TO1STEP-1:U=U+1:IFP1$=
   "-"THENA=A+S(I)*10↑U:GOTO31     :rem 142
30 A=A+A(I)*10↑U                   :rem 102
31 NEXT                            :rem 163
32 A=INT(A):L2=0:IFA<0THEN15       :rem 144
33 PRINT"{11 DOWN}":FORI=2TOY:PRINTTAB(7)
   ;P1$:NEXT:POKE160,0:POKE161,0:POKE162,
   0                               :rem 93
34 PRINT"{4 UP}":FORK=0TOP2:PRINTTAB(7+K)
   ;"{3 DOWN}C{DOWN}{LEFT} {5 UP}":NEXT
                                   :rem 135
35 PRINT"{3 DOWN}":U=LEN(STR$(A))-2:I=0:L
   1=0:FORK=P2TOP2-USTEP-1         :rem 246
36 FORM=6TO8:POKEM+E+154,ASC(MID$(TI$,M-2
   ))+128:NEXT:IFTI$="000400"THENGOSUB6:G
   OTO46                           :rem 66
37 GETA$:IFA$=""THENL=124:F=F+1:GOTO9
                                   :rem 184
38 IFASC(A$)=20THENPRINTTAB(7);"
   {7 SPACES}";"{5 UP}":GOTO35     :rem 239
39 IFA$="M"THENPOKEB+5,27:GOTO62   :rem 158
40 IFA$<"0"ORA$>"9"THEN37          :rem 98
41 L1=INT(L1+VAL(A$)*10↑I):I=I+1:PRINTTAB
   (7+K);A$:PRINT"{2 UP}":NEXT     :rem 21
42 IFL1=ATHENGOSUB5                :rem 212
43 IFL1<>ATHENGOSUB6               :rem 19
44 L2=L2+1:IFL2>2THEN46            :rem 77
45 PRINT"{2 UP}":GOTO34            :rem 54
46 V=0:AN$=STR$(A):L=LEN(AN$):IFL>P2+1THE
   NV=1                            :rem 208
47 IFL-1<P2THENV=L-1-P2            :rem 125
48 PRINTTAB(8-V);"{RVS}";MID$(AN$,2,8):FO
   RK=1TO3500:NEXT:GOTO15          :rem 3
49 IFP3$="N"ANDP1$="+"THEN52       :rem 44
50 GOSUB4:X=1:IFL<N+FTHEN54        :rem 193
51 RETURN                          :rem 70
52 IFL>NTHENX=-1:GOTO54            :rem 204
53 RETURN                          :rem 72
54 L=0:FORK=1TOY:M=(K*22)+I:F=PEEK(S+M)+X
   :IFF<48THENF=48                 :rem 176
55 IFF>57THENF=57                  :rem 7
```

```
56 POKES+M,F:L=L+(F-48):NEXT:GOTO49
                                    :rem 154
57 IFP3$="N"THEN60                   :rem 6
58 IFI=1ORF>=L1THENRETURN           :rem 161
59 GOTO61                            :rem 14
60 IFF<L1THENRETURN                  :rem 3
61 POKES+M,L1+48:POKES+M-22,F+48:S(I)=(-F
   )-L1:L1=F:RETURN                 :rem 149
62 M$="{HOME}{16 DOWN}":PRINT"{CLR}
   {3 DOWN}OPERATION (+/-).... ";P1$
                                    :rem 111
63 PRINT"{DOWN}# DIGITS (MAX=6)...";P2:PR
   INT"CARRY/BORROW..... ";P3$ :rem 221
64 PRINT"{DOWN}# PROBLEMS (MAX=9).";P4:PR
   INT"{DOWN}{4 SPACES}EEEEEEEEEEEEEE
                                    :rem 45
65 GOSUB7:PRINT"{3 DOWN}{5 SPACES}{CYN}
   {RVS}(B TO BEGIN)";"{GRN}{HOME}SELECT:
   USE CRSR(UP/DN){BLK}             :rem 162
66 M=7746                           :rem 206
67 IFM1=7878THENM=7746               :rem 38
68 FORI=MTOM+20:POKEI,PEEK(I)+128:NEXT
                                    :rem 129
69 GETA$:IFA$=""THEN69:A=A+128:POKEI,A:NE
   XT                               :rem 88
70 IFVAL(A$)<10ANDVAL(A$)>0THEN82:rem 159
71 IFA$="+"ORA$="-"ORA$="Y"ORA$="N"ORPEEK
   (197)=15THENA$="1":GOTO82        :rem 239
72 IFA$="{DOWN}"THEN77              :rem 140
73 IFA$="{UP}"THEN81                 :rem 8
74 IFA$<>"B"THEN69                  :rem 253
75 PRINT"{WHT}{CLR}{3 DOWN}91 DATA";P1$;"
   ,";P2;",";P3$;",";P4:PRINT"RUN12";"
   {HOME}                           :rem 158
76 :POKE198,3:POKE631,13:POKE632,13:POKE6
   33,13:END                        :rem 164
77 M2=M2-1:K=44                      :rem 49
78 M=M+K:FORI=M-KTOM-K+20:POKEI,PEEK(I)-1
   28:NEXT:IFM>7878THENM=7746       :rem 190
79 IFM<7746THENM=7878               :rem 247
80 ON(M-7702)/44GOSUB7,8,7,8:GOTO67
                                    :rem 249
81 M2=M2-1:K=-44:GOTO78              :rem 59
82 ON(M-7746)/44GOTO85,87,90:IFP1$="+"THE
   NP1$="-":GOTO84                  :rem 146
83 P1$="+"                          :rem 188
84 POKEM+20,ASC(P1$)+128:GOTO69      :rem 22
85 IFVAL(A$)>6THENA$="6"             :rem 84
86 P2=VAL(A$):POKEM+20,P2+176:GOTO69
                                    :rem 98
87 IFP3$="N"THENP3$="Y":GOTO89       :rem 8
88 P3$="N"                          :rem 230
89 POKEM+20,64+ASC(P3$):GOTO69      :rem 236
90 P4=VAL(A$):POKEM+20,P4+176:GOTO69
                                    :rem 97
91 DATA+, 1 ,Y, 2                   :rem 239
92 C=0:PRINT"{HOME}{BLK}":FORL=0TO15:GOSU
   B11:NEXT                         :rem 65
93 FORL=14TO0STEP-1:GOSUB11:NEXT:PRINT"
   {BLK}":C=40                      :rem 252
94 L8=L8+1:M=34816+8*L8:PRINT"{HOME}":IFL
   8-48>P4THEN98                    :rem 79
95 FORM1=MTOM+6:X=PEEK(M1):FORL=1TO7:C=32
   :X=X*2:IFX>255THENX=X-256:C=L8:rem 231
96 PRINTTAB(13)"{CYN}";CHR$(C);:NEXT:PRIN
   T"{BLK}":NEXT:IFL8-48>P4THEN98 :rem 75
97 GOTO15                           :rem 15
98 POKEB+5,27:PRINT"{CLR}";SPC(176);"
   {RVS}PLAY ANOTHER GAME(Y/N){OFF}"
                                    :rem 48
99 GETZ$:IFZ$=""OR(Z$<>"Y"ANDZ$<>"N")THEN
   99                               :rem 29
100 IFZ$="N"THENEND                 :rem 115
101 RUN1                            :rem 184
```

Program 2: Robot Math—64 Version

```
10 PRINT"{CLR}":POKE53281,1:POKE53280,5:R
   EADP1$,P2,P3$,P4:GOTO710         :rem 145
12 READP1$,P2,P3$,P4:B=54272         :rem 18
15 FORI=BTOB+24:POKEI,0:NEXT:VO=B+24:AD=B
   +5:SR=AD+1:HF=B+1:LF=B:POKEAD,20:rem 6
16 POKESR,200:SO=B+4:GOTO130         :rem 186
20 POKESO,32:RETURN                  :rem 222
30 POKEHF,50:POKELF,40:POKESO,33:FORM=1TO
   C:NEXT:GOTO20                    :rem 233
40 F=INT(RND(1)*9):RETURN             :rem 6
50 POKESO,33:FORL=99TO255:POKEHF,L:POKELF
   ,50:NEXT:GOSUB20:GOTO1050        :rem 236
60 POKESO,33:POKEHF,60:POKELF,50:FORM=1TO
   400:NEXT:GOTO20                  :rem 63
70 PRINTM$;"{8 SPACES}{RVS}{BLU}PRESS RET
   URN TO CHANGE":RETURN            :rem 229
80 PRINTM$;"{13 SPACES}{RVS}{BLU}ENTER DI
   GIT{OFF}{8 SPACES}":RETURN       :rem 177
90 IFF>5THENL=126:IFF>9THENL=108:M=1:IFF>
   30THENL=90:M=0:IFF>50THENL=108:M=1
                                    :rem 139
100 IFF>99THENF=0                   :rem 248
110 POKEE,L:POKEE+1,L:GOTO430        :rem 10
120 PRINT"{HOME}":PRINTTAB(L);M$;O$;:POKE
    VO,15:GOSUB30:POKEVO,0:PRINTN$:RETURN
                                    :rem 224
130 POKE649,1:M$=" N[2 T]M {DOWN}{6 LEFT}
     MZZN {DOWN}{6 LEFT} [F]L@[D] {DOWN}
    {6 LEFT} £[Q][W][*] {DOWN}{6 LEFT}
    {2 SPACES]OP"                   :rem 141
140 M$=M$+"{2 SPACES}{DOWN}{6 LEFT} {RVS}
    £{2 SPACES}[*]{OFF} "            :rem 14
150 N$="{6 LEFT} WWWW ":O$="{DOWN}
    {6 LEFT} ZZZZ "                 :rem 232
160 PRINT"{CLR}{9 DOWN}{RVS}{GRN} M=MENU-
    ----------DEL=ERASE {OFF}
    {HOME}"                         :rem 181
165 POKE214,23:PRINT:POKE211,15     :rem 73
170 L8=48:POKE143,PEEK(162):GOTO1050
                                    :rem 58
180 POKE651,255:PRINT"{HOME}":R=54272:S=1
    561:Y=P2:E=1106:RW=16:WR=RW-4:POKEVO,
    15                              :rem 213
190 IFP2=3THENRW=17:WR=RW-5         :rem 195
200 IFP1$="-"ORP2=1ORP2>3THENY=2    :rem 144
210 POKE214,RW:PRINT:POKE211,17:PRINT"
    {7 SPACES}"                     :rem 145
220 FORI=P2TO1STEP-1:A(I)=0:S(I)=0:FORK=1
    TOY:GOSUB30:GOSUB40              :rem 24
230 A(I)=A(I)+F:S(I)=S(I)-F         :rem 189
240 M=(K*40)+I:POKER+S+M,0:POKES+M,F+48:I
    FK=1THENL1=F                    :rem 185
250 NEXT:IFP1$="-"THENGOSUB660:GOTO270
                                    :rem 73
260 L=A(I):N=9:GOTO280               :rem 7
270 S(I)=S(I)+2*L1:L=S(I):N=0       :rem 89
280 GOSUB580:A(I)=L                 :rem 85
290 NEXTI                           :rem 35
300 FORK=1TOY:FORI=1TOP2            :rem 44
310 M=K*40+I:IFPEEK(S+M)>48THEN340
                                    :rem 229
320 IFI=P2THENV=1                    :rem 31
330 POKES+M,32:NEXT                 :rem 154
340 NEXTK:IFV=1THENV=0:GOTO180      :rem 172
```

```
350 A=0:U=-1:FORI=P2TO1STEP-1:U=U+1:IFP1$
    ="-"THENA=A+S(I)*10↑U:GOTO370:rem 241
360 A=A+A(I)*10↑U                  :rem 156
370 NEXT                           :rem 217
380 A=INT(A):L2=0:IFA<0THEN180     :rem 249
390 FORI=2TOY:POKE214,WR+I:PRINT:POKE211,
    17:PRINT"{BLK}"P1$:NEXT        :rem 145
400 POKE160,0:POKE161,0:POKE162,0:rem 113
410 FORK=0TOP2:POKE214,RW-1:PRINT:POKE211
    ,17+K:PRINT"C":NEXT            :rem 161
420 U=LEN(STR$(A))-2:I=0:L1=0:FORK=P2TOP2
    -USTEP-1                       :rem 230
430 FORM=15TO17:POKEM+E+R+280,0:POKEM+E+2
    80,ASC(MID$(TI$,M-11))+128:NEXT
                                   :rem 211
440 IFTI$="000400"THENGOSUB60:GOTO550
                                   :rem 175
450 GETA$:IFA$=""THENL=124:F=F+1:GOTO90
                                   :rem 23
460 IFASC(A$)=20THENPOKE214,RW:PRINT:POKE
    211,17:PRINT"{7 SPACES}":GOTO420
                                   :rem 139
470 IFA$="M"THEN710                :rem 36
480 IFA$<"0"ORA$>"9"THEN440        :rem 200
490 PRINT"{DOWN}":L1=INT(L1+VAL(A$)*10↑I)
    :I=I+1                         :rem 135
500 POKE214,RW:PRINT:POKE211,17+K:PRINTA$
    :NEXT                          :rem 163
510 IFL1=ATHENGOTO50               :rem 237
520 IFL1<>ATHENGOSUB60             :rem 115
530 L2=L2+1:IFL2>2THEN550          :rem 173
540 GOTO410                        :rem 103
550 V=0:AN$=STR$(A):L=LEN(AN$):IFL>P2+1TH
    ENV=1                          :rem 0
560 IFL-1<P2THENV=L-1-P2           :rem 173
570 POKE214,RW:PRINT:POKE211,18-V:PRINT"
    {RVS}";MID$(AN$,2,8)           :rem 47
575 FORK=1TO3500:NEXT:GOTO180      :rem 49
580 IFP3$="N"ANDP1$="+"THEN610     :rem 140
590 GOSUB40:X=1:IFL<N+FTHEN630     :rem 90
600 RETURN                         :rem 118
610 IFL>NTHENX=-1:GOTO630          :rem 44
620 RETURN                         :rem 120
630 L=0:FORK=1TOY:M=(K*40)+I:F=PEEK(S+M)+
    X:IFF<48THENF=48               :rem 224
640 IFF>57THENF=57                 :rem 55
650 POKES+M,F:L=L+(F-48):NEXT:GOTO580
                                   :rem 250
660 IFP3$="N"THEN690               :rem 111
670 IFI=1ORF>=L1THENRETURN         :rem 209
680 GOTO700                        :rem 110
690 IFF<L1THENRETURN               :rem 60
700 POKES+M,L1+48:POKES+M-40,F+48:S(I)=(-
    F)-L1:L1=F:RETURN              :rem 197

710 M$="{HOME}{16 DOWN}"           :rem 173
720 PRINT"{CLR}{BLK}{3 DOWN}{8 RIGHT}OPER
    ATION (+/-).... ";P1$          :rem 201
730 PRINT"{DOWN}{8 RIGHT}# DIGITS (MAX=6)
    ...";P2                        :rem 60
740 PRINT"{DOWN}{8 RIGHT}CARRY/BORROW....
    ... ";P3$                      :rem 20
750 PRINT"{DOWN}{8 RIGHT}# PROBLEMS (MAX=
    9).";P4                        :rem 135
760 PRINT"{DOWN}{8 RIGHT}{4 SPACES}EEEEEE
    EEEEEEEE                       :rem 11
770 GOSUB70:PRINT"{3 DOWN} {8 RIGHT}
    {4 SPACES}{BLU}{RVS}(B TO BEGIN)";
                                   :rem 178
780 PRINT"{GRN}{HOME}{8 RIGHT}SELECT:USE
    {SPACE}CRSR(UP/DN){BLK}"       :rem 241
790 M=1152                         :rem 247
800 IFM1=1392THENM=1152            :rem 51
810 FORI=MTOM+20:X=PEEK(I):POKEI,X+128:NE
    XT                             :rem 211
820 GETA$:IFA$=""THEN820           :rem 87
830 IFVAL(A$)<10ANDVAL(A$)>0THEN950:rem 7
840 IFA$="+"ORA$="-"ORA$="Y"ORA$="N"ORPEE
    K(197)=1THENA$="1":GOTO950     :rem 34
850 IFA$="{DOWN}"THEN900           :rem 235
860 IFA$="{UP}"THEN940             :rem 112
870 IFA$<>"B"THEN820               :rem 92
880 PRINT"{WHT}{CLR}{3 DOWN}1040 DATA";P1
    $;",";P2;",";P3$;",";P4:PRINT"RUN12";
    "{HOME}"                       :rem 79
890 :POKE198,3:POKE631,13:POKE632,13:POKE
    633,13:END                     :rem 216
900 M2=M2-1:K=80                   :rem 92
910 M=M+K:FORI=M-KTOM-K+20:X=PEEK(I):POKE
    I,X-128:NEXT:IFM>1392THENM=1152
                                   :rem 242
920 IFM<1152THENM=1392             :rem 4
930 ON(M-1064)/80GOSUB70,80,70,80:GOTO800
                                   :rem 19
940 M2=M2-1:K=-80:GOTO910          :rem 154
950 ON(M-1152)/80GOTO980,1000,1030:IFP1$=
    "+"THENP1$="-":GOTO970         :rem 204
960 P1$="+"                        :rem 240
970 POKEM+20,ASC(P1$)+128:GOTO820:rem 117
980 IFVAL(A$)>6THENA$="6"          :rem 136
990 P2=VAL(A$):POKEM+20,P2+176:GOTO820
                                   :rem 193
1000 IFP3$="N"THENP3$="Y":GOTO1020
                                   :rem 172
1010 P3$="N"                       :rem 56
1020 POKEM+20,64+ASC(P3$):GOTO820:rem 105
1030 P4=VAL(A$):POKEM+20,P4+176:GOTO820
                                   :rem 231
1040 DATA+, 1 ,Y, 1                :rem 73
1050 C=0:PRINT"{HOME}{BLK}":FORL=0TO34:GO
    SUB120:NEXT                    :rem 206
1060 FORL=33TO0STEP-1:GOSUB120:NEXT:PRINT
    "{BLU}":C=40                   :rem 24
1070 POKE56334,PEEK(56334)AND254:POKE1,PE
    EK(1)AND251                    :rem 233
1080 L8=L8+1:IFL8-48>P4THEN1120    :rem 5
1090 M=53247+8*L8:PRINT"{HOME}";   :rem 195
1100 FORM1=MTOM+7:X=PEEK(M1):FORL=1TO7:C=
    32:X=X*2:IFX>255THENX=X-256:C=209
                                   :rem 83
1110 PRINTTAB(30)"{BLK}"CHR$(C);:NEXT:PRI
    NT"{7 LEFT}{DOWN}";:NEXT       :rem 19
1120 POKE1,PEEK(1)OR4:POKE56334,PEEK(5633
    4)OR1                          :rem 179
1130 IFL8-48>P4THEN1150            :rem 41
1140 GOTO180                       :rem 152
1150 PRINT"{CLR}":POKE214,12:PRINT:POKE21
    1,4                            :rem 222
1155 PRINT"{RVS}{BLK}HOW ABOUT ANOTHER GA
    ME (Y/N)?{OFF}"                :rem 203
1160 GETZ$:IFZ$=""OR(Z$<>"Y"ANDZ$<>"N")TH
    EN1160                         :rem 201
1170 IFZ$="Y"THENRESTORE:CLR:GOTO10
                                   :rem 242
1180 END                           :rem 161
```

BEFORE TYPING...

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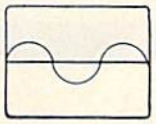

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